

ANNUAL MANAGEMENT REPORT
1995
NORTON SOUND - PORT CLARENCE - KOTZEBUE

By
Fredrick J. Bue
Tracy L. Lingnau
Charles F. Lean
Elisabeth L. Brennan

Regional Information Report¹ No. 3A96-30

Alaska Department of Fish and Game
Division of Commercial Fisheries Management and Development
333 Raspberry Road
Anchorage, Alaska 99518-1599

October 1996

¹ The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author of the Division of Commercial Fisheries.

OFFICE OF EQUAL OPPORTUNITY (OEO) STATEMENT

The Alaska Department of Fish and Game conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648, or (fax) 907-586-6596. Any person who believes s/he has been discriminated against should write to: ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of Interior, Washington, D.C. 20240.

AUTHORS

Fredrick J. Bue is the AYK Region Norton Sound Assistant Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Pouch 1148, Nome, AK 99762.

Charles F. Lean is the AYK Region Western Arctic Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Pouch 1148, Nome, AK 99762.

Tracy L. Lingnau is the AYK Region Kotzebue Assistant Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Box 689, Kotzebue, AK 99752.

Elisabeth L. Brennan is a AYK Region Norton Sound Seasonal Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Pouch 1148, Nome, AK 99762.

ACKNOWLEDGEMENTS

Many people contributed toward the collection and processing of the data contained in this report. Alaska Department of Fish and Game seasonal employees work long and hard hours in providing the management staff with timely and useful fishery, abundance, and escapement information. We would like to thank the various project crew leaders, catch monitors, and the Field Office Assistant who, over the past year, have acted as liaisons for the management staff in communicating with the public and on whose shoulders the burden of gathering the baseline data displayed in this report has rested most directly. We also thank the Regional biologist staff for technical assistance and acknowledge the data collection of many technicians and volunteers this past seasons.

TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURES	viii
LIST OF APPENDICES	x
PRESENTATION	xiv
SECTION 1: SALMON	
INTRODUCTION	2
Boundaries	2
Salmon Resources	2
Commercial Fishery	1
Subsistence Fishery	3
Management	3
NORTON SOUND DISTRICT	4
District Boundaries	4
Historical Fishery Use	5
Commercial Fishery Overview	6
Commercial Fishery Management	7
Subsistence Fishery Overview	8
Regulatory Actions in Nome Subdistrict	9
1995 Norton Sound Salmon Fishery	11
Commercial Fishery Summary	11
Subsistence Fishery Summary	12
Season Summary by Subdistrict	13
Escapement	17
Management Concerns	20
1996 Outlook	20
PORT CLARENCE DISTRICT	48
District Boundaries	48
Commercial Fishery	48
Subsistence Fishery	48
Escapement	49
KOTZEBUE SOUND	55
History	55
General Information	55
Inseason Management	56
Commercial Season Summary	57
Sikusuilag Hatchery Stocky	58

TABLE OF CONTENTS (Continued)

	Page
Escapement	58
Dolly Varden	59
Freshwater Fisheries	59
Subsistence	60
1996 Outlook	60
SECTION 2: PACIFIC HERRING	
INTRODUCTION	89
Boundaries	89
Spawning Areas and Timing	89
NORTON SOUND DISTRICT	89
Fishing History	89
Food Herring	90
Sac Roe	90
Spawn on Kelp	91
Management Strategies	91
1995 SEASON SUMMARY	92
Fishery Management/Emergency Orders	93
Catch Reporting and Enforcement	95
Abundance and Research	95
Biomass Determination	96
1996 Outlook	96
PORT CLARENCE / KOTZEBUE DISTRICTS	113
Introduction	113
Resource Investigations	113
Fall Food/Bait Fishery	115
Sac Roe Fishery	115
SECTION 3: KING CRAB	
INTRODUCTION	118
Norton Sound	118
St. Lawrence Island	118
1995 COMMERCIAL FISHERY	119
Norton Sound Summer Commercial Fishery	119

TABLE OF CONTENTS (Continued)

	Page
Pre-season Pot Survey	121
Commercial Catch Sampling	122
Enforcement	122
Norton Sound Winter Commercial Fishery	123
 SUBSISTENCE FISHERY	 123
 STOCK STATUS / RESEARCH	 124
 FUTURE INVESTIGATIONS	 126
 1996 OUTLOOK	 126
 SECTION 4: MISCELLANEOUS SPECIES	
 INTRODUCTION	 146
 INCONNU (Sheefish)	 146
Introduction	146
Commercial Fishery	147
Subsistence Fishery	147
Escapement	147
 DOLLY VARDEN	 152
Introduction	152
Commercial Fishery	152
Subsistence Fishery	152
Sport Fishery	153
Overwintering Counts	153
 WHITEFISH	 157
Introduction	157
Commercial Fishery	157
Subsistence Fishery	158
Escapement	158
 SAFFRON COD	 160
MISCELLANEOUS FINFISH SPECIES	160
 LITERATURE CITED	 160

LIST OF TABLES

Table.	Page
1. Norton Sound commercial salmon catch by subdistrict, 1995	22
2. Nome area subsistence salmon catches, Norton Sound, 1995	23
3. Salmon survey counts of Norton Sound streams and associated chum salmon escapement goals, 1995.....	24
4. Commercial salmon set gillnet catches from Nome, Subdistrict 1, Norton Sound, 1995	25
5. Commercial salmon set gillnets catches from Golovin, Subdistrict 2, Norton Sound, 1995	26
6. Commercial salmon set gillnets catches from Moses Point, Subdistrict 3, Norton Sound, 1995	27
7. Commercial salmon set gillnets catches from Shaktoolik, Subdistrict 5, Norton Sound, 1995	28
8. Commercial salmon set gillnets catches from Unalakleet, Subdistrict 6, Norton Sound, 1995	29
9. 1995 Norton Sound area subsistence salmon harvests.....	30
10. 1995 Port Clarence subsistence harvests.....	51
11. Commercial catches of chum salmon, chinook salmon and Dolly Varden by period, in the Kotzebue District, 1995.	61
12. Kotzebue District commercial chum salmon, chinook salmon and Dolly Varden catch by statistical area, 1995.....	62
13. Kotzebue Sound chum salmon 1995 commercial and 16 year average catch statistics (1980-1994)	63
14. Historical average age composition by period for the recent 16 years (1980-1994) and 1995.....	64
15. Kobuk River drift test fish historical mean daily and cumulative CPUE and CPUE proportions, 1993-1995	65

LIST OF TABLES (Continued)

Table	Page
16. Noatak River test fish mean daily and cumulative CPUE for the right bank, 1993-1995	66
17. 1995 Kotzebue Sound subsistence salmon harvests	67
18. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1995	97
19. Norton Sound herring spawn estimates by subdistrict (s.d.), 1995	98
20. Port Clarence District commercial herring fishing history.....	116
21. Commercial harvest of red king crab from Norton Sound Section by statistical area, Northern Bering Sea District, 1995 (summer fishery only)	127
22. Winter 1994-95 subsistence red king crab catches and effort by gear type, Norton Sound area	128

LIST OF FIGURES

Figure	Page
1. Norton Sound commercial salmon fishing subdistricts	31
2. Port Clarence District.....	52
3. Kotzebue Sound commercial fishing district, villages and subsistence fishing areas	68
4. Kotzebue Sound commercial fishing subdistricts and statistical areas.....	69
5. Kotzebue District historical chum salmon commercial catch	70
6. Kotzebue District previous 16 year average (1980-1994) and 1995 catch and catch per unit effort comparisons	71
7. Kotzebue Sound chum salmon age composition by period comparing the recent 16 year average (1979-1994) to 1995	72
8. Kotzebue District chum salmon aerial survey escapement estimates for primary index streams, 1962-1995. Indices listed in this table are the peak survey observed for each tributary during the given year	73
9. Kobuk River chum salmon drift test fish cumulative CPUE, 1993-1995.....	74
10. Noatak River chum salmon chum salmon drift test fish cumulative CPUE for the right bank, 1993-1995.....	75
11. Norton Sound commercial herring district (333) and statistical boundaries	99
12. Statistical areas of the Norton Sound, Port Clarence and Kotzebue commercial herring fishery districts	100
13. Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gillnets), 1981-1995.....	101
14. Norton Sound herring age class composition by percentage of total catch, variable mesh gillnets, 1981-1995.....	104
15. Norton Sound Pacific herring age composition comparison by gear type of capture, 1995, and the projected age composition of the 1996 return	107

LIST OF FIGURES (Continued)

Figure	Page
16. Statistical areas for the Norton Sound red king crab fishery	129
17. King crab fishing districts and sections of Statistical Area Q	130
18. Norton Sound male and female red king crab size distribution from a trawl assessment survey conducted by the National Marine Fisheries Service, 1991	131
19. Norton Sound male red king crab size distribution from pot assessment surveys conducted by the Alaska Department of Fish and Game, 1980, 1981, 1982, and 1985	132
20. Norton Sound male red king crab size distribution from trawl assessment surveys conducted by the National Marine Fisheries Service, 1976, 1979, 1982, 1985, 1988, and 1991	133
21. Norton Sound red king crab summer commercial catch samples, 1981-1995	135
22. Kotzebue and Kobuk River Valley villages and their spatial relationship with inconnu spawning and overwintering areas	148

LIST OF APPENDICES

Appendix		Page
A1.	Number of commercial salmon fishermen fishing in Norton Sound, 1970-1995	32
A2.	Commercial and Subsistence salmon catches by species, by year in Nome Subdistrict, Norton Sound District, 1964-1995	33
A3.	Commercial and subsistence salmon catches by species, by year in Golovin Subdistrict, Norton Sound District, 1962-1995	34
A4.	Commercial and subsistence salmon catches by species, by year in Moses Point Subdistrict, Norton Sound District, 1962-1995	35
A5.	Commercial and subsistence salmon catches by species, by year in Norton Bay Subdistrict, Norton Sound District, 1962-1995	36
A6.	Commercial and subsistence salmon catches by species, by year in Shaktoolik Subdistrict, Norton Sound District, 1961-1995	37
A7.	Commercial and subsistence salmon catches by species, by year in Unalakleet Subdistrict, Norton Sound District, 1961-1995	38
A8.	Commercial and subsistence salmon catches by species, by year for all subdistricts in Norton Sound District, 1961-1995	39
A9.	Mean salmon weights, Norton Sound District, 1962-1995	40
A10.	Estimated mean prices paid to commercial salmon fishermen, Norton Sound District, 1962-1995	41
A11.	Dollar estimates of Norton Sound District commercial salmon fishery, 1961-1995	42
A12.	Round weight of commercially caught salmon by species, Norton Sound District, 1961-1995	43
A13.	Comparative salmon escapement estimates of Norton Sound streams, 1961-1995	44
B1.	Subsistence salmon catches for Port Clarence District, 1963-1995	53

LIST OF APPENDICES (Continued)

Appendix	Page
B2. Comparative sockeye salmon aerial survey indecies, Port Clarence District, 1963-1995	54
C1. Kotzebue District chum salmon commercial catch statistics, 1962-1995	76
C2. Kotzebue District chum salmon type of processing and weights, 1962-1995	77
C3. Kotzebue District commercial fishery dollar value estimates, 1962-1995	78
C4. Kotzebue District mean prices paid per pound to salmon fishermen by species, 1962-1995	79
C5. Kotzebue District commercial and subsistence salmon catches, 1914-1995	80
C6. Kotzebue District subsistence chum salmon catches by village, 1962-1995	81
C7. Kotzebue District mean subsistence chum salmon catch per fishermen by village, 1962-1995	82
C8. Chum salmon aerial survey counts for the Kotzebue District, 1962-1995	83
C9. Kotzebue District commercial age and sex composition of chum salmon, 1962-1995	87
D1. Norton Sound herring and spawn-on-kelp harvests (in short tons) by U.S. commercial fishermen, 1909-1995	108
D2. Japanese gillnet herring catches in Norton Sound, 1968-1977. (North of 63 N. Latitude and East of 167 W. Longitude)	109
D3. Herring biomass estimate and commercial fisheries data for the Norton Sound District, 1979-1995	110
D4. Norton Sound commercial herring harvest (st) by subdistrict, by year, 1979-1995	111

LIST OF APPENDICES (Continued) Appendix

Appendix	Page
D5. Norton Sound commercial spawn-on-kelp (<i>Fucus</i>) harvest, 1978-1984	112
E1. Comparison of annual summer commercial harvest of red king crab from the Norton Sound Section, Eastern Bering Sea, by statistical areas, 1977-1995 (catch in pounds).....	139
E2. Percent recruit and postrecruit size male red king crab from commercial catch samples by year, Norton Sound Section, Bering Sea	140
E3. Historic Summer commercial red king crab economic performance, Norton Sound Section , Bering Sea, 1976-1995	141
E4. Winter commercial and subsistence red king crab harvests, Norton Sound, Bering Sea, 1978-1995.....	142
E5. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976	143
E6. Size composition by percent of red king crab from winter research pots near Nome, Norton Sound, Bering Sea, 1983-1995	144
F1. Kotzebue District winter commercial Sheefish harvest statistics, 1967-1995	149
F2. Reported subsistence inconnu catches, Kotzebue District, 1966-1995	150
F3. Annual aerial survey counts of sheefish in the Kobuk and Selawik Rivers, 1966-1995	151
F4. Kotzebue District incidental caught and sold Dolly Varden during the commercial salmon fishery, 1966-1995	154
F5. Fall subsistence catches of Dolly Varden documented in Kivalina and Noatak, 1959-1995.....	155
F6. Aerial survey counts of overwintering and spawning Dolly Varden in the Kotzebue District watershed, 1968-1995	156
F7. Subsistence whitefish catch and effort in the Kotzebue District, 1970-1995	159

LIST OF APPENDICES (Continued)

Appendix	Page
G1. List of common and scientific names of finfish species of Norton Sound, Port Clarence, and Kotzebue Districts	161
G2. Studies conducted within the Norton Sound, Port Clarence, and Kotzebue Districts, 1995	162
G3. Emergency orders issued during 1995	168
G4. Norton Sound-Port Clarence-Kotzebue Sound processor and associated data, 1995	186

PRESENTATION

This report summarizes the 1995 season and historical information concerning management of the commercial and subsistence fisheries of the Norton Sound, Port Clarence and Kotzebue Sound districts. Data from special management and research projects are included in this report. A more complete documentation of project results will be presented in separate reports.

Data presented in this report supersedes information found in previous management reports. An attempt has been made to correct errors presented in earlier reports. Previously unreported data has been included and is indicated by appropriate footnotes. Current year catch data presented has been derived from seasonal field data.

This report is organized into the following major sections:

- (1) Salmon
- (2) Herring
- (3) King Crab
- (4) Miscellaneous species

In order to facilitate use of this report, tabular data has been separated into two categories: 1) tables presenting annual data; 2) appendix tables which present historic comparisons. The text for each major section is followed by tables, figures, and appendices.

SECTION 1: SALMON
(Includes Norton Sound, Port Clarence
and Kotzebue Districts)

SECTION 1 - SALMON

INTRODUCTION

Boundaries

The Norton Sound, Port Clarence and Kotzebue salmon management districts include all waters from Canal Point in southern Norton Sound to Point Hope and includes St. Lawrence Island. These management districts comprise over 65,000 square miles, with a coastline exceeding that of California, Oregon, and Washington combined.

Salmon Resources

Five species of Pacific salmon are indigenous to the area with chum (Oncorhynchus keta) and pink salmon (O. gorbuscha) historically being the most abundant. Chum, pink, and chinook (king) salmon (O. tshawytscha) have been found as far north as Barrow; however, these species are uncommon north of the Kotzebue Sound drainages. The northernmost large concentrations of chum salmon are found within the Kotzebue Sound drainages, while large numbers of pink, chinook and coho (O. kisutch) salmon are not found north of Norton Sound. Very small sockeye (red) salmon (O. nerka) populations exist within a few Seward Peninsula drainages.

Commercial Fishery

In 1959 and 1960, Department biologists conducted resource inventories which indicated harvestable surpluses of salmon available in several rivers systems of the Norton Sound Arctic area. The Department liberalized various regulations and encouraged processors to explore and develop new fishing grounds. As a result, commercial salmon fishing activity has grown significantly since statehood, enabling many local residents to obtain a cash income.

The majority of commercial fishermen and many buying station workers are resident Eskimos. Commercial fishermen operate set gillnets from outboard powered skiffs to capture salmon. All commercial salmon fishing is done in coastal marine waters.

Salmon effort and catch per unit effort data (CPUE) presented throughout this section have been derived as follows. Boat (or fisherman) hours have been computed after assuming that if a fishing boat delivers during a fishing period, it fished the entire period. The total number of individual boats delivering in any period is multiplied by the number of hours open to commercial fishing. Catch per fisherman (or boat) hour is obtained by dividing the total fishermen hours into the catch for the corresponding period of time. Total fishermen (or boats) is the total number of fishermen making deliveries, regardless of how many deliveries were made or days fished during a particular period or

season. There are a number of fishermen who deliver only once or twice during the entire season. Total days fished is the total number of hours open to commercial fishing during the season divided by 24 hours.

Subsistence Fishery

There are approximately 16,000 people in the area, the majority of whom are Eskimos, residing in more than 26 small villages scattered along the coast and the major river systems. Nearly all of the local people are dependent to varying degrees on the fish and game resources for their livelihood.

Subsistence fishermen operate gillnets or seines in the main rivers and, to a lesser extent, in the coastal marine waters capturing primarily salmon, whitefish, arctic char and inconnu (sheefish). Beach seines are used near the spawning grounds to catch schooling or spawning salmon and other species of fish. The major portion of fish taken during the summer months is air dried or smoked for later consumption by villagers or occasionally their dogs.

Subsistence catch information has been derived from interviews of fishermen, actual counts of fish, and subsistence catch calendars returned by fishermen. Subsistence salmon catches in the Nome Subdistrict (Subdistrict 1) have been determined from the return of catch calendars as required under a permit system.

The Department conducted annual surveys of the important subsistence salmon fisheries from the early 1960's until 1982. Subsistence harvest information prior to 1960 is incomplete or entirely lacking for many years. Beginning in 1983, budgetary restrictions have made it impossible to conduct systematic surveys in each village as was done from 1964 to 1982. For the last 5 years that complete surveys were conducted for Norton Sound (1978-1982) the average subsistence catch was 73,000 salmon including all species (Appendix Table A8). The majority of salmon taken are pinks and chums. Subsistence surveys for the Kotzebue area were less complete. An expansion of documented surveys from several years for different villages estimates total subsistence salmon harvest for the Kotzebue Sound area to approach 75,000 (Appendix Table C6). These reported harvests are primarily based on village household surveys. Since not all fishermen are contacted, these harvests should be considered minimum figures. In 1994 and 1995, the Department initiated a new subsistence salmon harvest assessment effort in Northwest Alaska which provided more extensive, complete, and reliable salmon harvest estimates than existed previously.

Management

The Division of Commercial Fisheries of the Alaska Department of Fish and Game is responsible for the management of commercial and subsistence fisheries in this vast area. The permanent full-time staff assigned to this area during 1993 consisted of an area management biologist stationed in Nome, an assistant area biologist stationed in Nome, an Area Fish Culturist, an assistant management biologist in Kotzebue, a Research Biologist assigned to Anchorage and seasonally to Kotzebue, and a Field Office

Assistant (FOA) assigned to the Nome office. In addition, summer seasonal assistance in conducting various management and research activities was provided by 17 seasonal biologists and technicians in Norton Sound and Kotzebue Sound. Additional assistance was provided by biologists from the regional staff.

The main objective of the Department's program is to manage the commercial salmon fisheries on a sustained yield basis. Various field projects are conducted to provide information on salmon abundance, migration and stock composition. Summaries of these projects are presented in Appendix G2.

Management of the salmon fishery is complicated by the difficulty in obtaining valid escapement data in this large area and by insufficient comparative catch and return information. Management problems are compounded by the need to provide not only for adequate escapements, but for the needs of several different user groups. Past Alaska Department of Fish and Game policy has been to provide for subsistence as the primary beneficial use of the fishery resource. This policy is now State law. If the subsistence harvest or demands increase, commercial fishing may be restricted. It should be pointed out that increases in commercial fishing efficiency are expected and may balance any immediate decline in subsistence utilization or increase in run size with the result that present regulations have been maintained or made even more restrictive.

The basic regulation that governs the commercial salmon harvest in all districts is the scheduled weekly fishing period. Commercial fishing regulations provide for a total of two to four days of fishing per week during the open season depending on area and season. The Department attempts to distribute fishing effort throughout the entire return to avoid harvesting only particular segments of the return. Occasionally, fishing time is increased or decreased by emergency order, depending upon fishing conditions and the strength of the returns or spawning escapements, as determined by special studies conducted by the Department. Emergency orders issued during the 1994 seasons are presented in Appendix G3.

Weekly fishery reports, which give information on fishery status and fishing schedules, are broadcast during the fishing season over radio KICY and KNOM in Nome, and KOTZ in Kotzebue. In addition, fishery news articles are published in the Nome Nugget and the Arctic Sounder.

NORTON SOUND DISTRICT

District Boundaries

The Norton Sound District includes all waters from Canal Point Light north to Cape Douglas. This district is subdivided into six subdistricts: Nome (Subdistrict 1), from Penny River to Topkok Head; Golovin Bay (Subdistrict 2), from Rocky Point to Cape Darby; Moses Point (Subdistrict 3), from Elim Point to Kwik River; Norton Bay (Subdistrict 4), from Kuiuktulik River to Island Point; Shaktoolik

(Subdistrict 5), from Cape Denbigh to Junction Creek; and Unalakleet (Subdistrict 6), from Junction Creek to Black Point (Figure 1).

Each of these subdistricts contain at least one major salmon spawning stream. All commercial fishing is conducted in marine waters and usually concentrated near stream mouths. Subdistrict boundaries were established around the major salmon producing local streams to minimize interception of stocks bound for other areas.

Historical Fishery Use

Fishing has been a part of life for Norton Sound residents for many centuries as indicated by archeological evidence dating back 2,000 years (Bockstoe, 1979). There were only a few actual pre-contact settlements like Shishmaref and Wales which still exist today. They were located where marine mammals were the primary subsistence resource. The rest of the population lived in small groups scattered along the coast and often moved on a seasonal basis prior to the introduction of western civilization (Thomas 1982). During summer months residents would disperse, usually in groups comprised of one or two families, and setup camps near the mouths of streams. Harvest levels of fish on any one stream were relatively small because of the low concentrations of people who caught only what their families and one or two dogs needed through the winter (Thomas 1982).

A large scale fur trade had been developed by the Russians in the late 1800's which continued after the American purchase (Magdanz 1981). The activities and support for hundreds of commercial whalers and trading ships caused trading to increase in the region around 1848 (Ray 1975). The increased competition for walrus, caribou, and other species from outsiders may have increased the importance of salmon to area residents (Magdanz 1981). In the late 1890's gold was discovered on the Seward Peninsula and boom-towns sprang up with thousands of new immigrants flocking to the region. Commerce developed which drew people to central locations that evolved into year-round communities. Other reasons for communities to become established stemmed from the operation of missions.

The impacts of mining was significant on fish populations. Nearly every stream on the Seward Peninsula had some sort of mining operation working on it which ranged from simple gold panning to sluice boxes to hydraulic giants to bucket line dredges. One example of extensive impact was on the Solomon River which is only 30 miles long but had 13 dredges working at one time. Another obvious impact was simply the large number of people who came to live in the region between 1900 and 1930. Communities like Nome, with a population of 30 thousand and Council with 10 thousand people at one time, did not exist before gold was discovered.

It was in the late 19th century when the size of the dog teams increased from two or three to as many as ten to twenty. At about the same time wooden boats began to replace kayaks (Thomas 1982). Consequently, the demand for dry fish to feed the dog teams increased along with the development of better means to harvest fish. Winter transportation throughout the region was done with hired dog teams and drivers who carried mail or freight along the coast and across the state to the ice-free port at

Seward. Dry fish became a major barter item in response to the great demand for dog food which consisted of primarily chum and pink salmon (Thomas 1982).

Local residents would spend most of their summers catching and drying large amounts of salmon, some of which they kept for themselves and the rest would be bartered or sold to mining camps, roadhouses, and trading posts or stores. For example, the Haycock mining camp on the Koyuk River would buy about two tons of dry fish each year. There were roadhouses at Golovin, Walla, Moses Point, Isaac's Point, Ungalik, Robertvale, foothills (south of Shaktoolik), Egavik, and many other locations. Dry fish was bought in units of bundles (50 dry fish tied together) at a typical price of 10 cents per pound from the fishermen. One elder in the area felt that more fish were retained for their own use as compared to the amount sold which may have averaged five to ten bundles per household (Thomas 1982).

After the gold rush the number of people gradually decreased over the next twenty years as the gold deposits were worked out. The number of dog teams diminished by the mid 1930's with the introduction of the mail plane. The last mail team contract ended in 1962 at Savoonga. Local stores continued to trade in dry fish at Shaktoolik, Saint Michael, Unalakleet, and Golovin. An example of quantity was the Shaktoolik store that had a cache 8x20x40 feet which would be filled to the top with dry fish. One elder said the stores would buy the fish for 6 cents a pound and sell them for 10 cents a pound or their equivalent in groceries and supplies (Thomas 1982). By the early 1960's, commercial salmon fishing developed into a source of summer cash and snowmachines were replacing the need for dog teams (Thomas 1982). Dry fish was no longer needed to feed dogs and cash was becoming more available for trading at stores.

Commercial Fishery Overview

Commercial salmon fishing in this district first began in the Unalakleet and Shaktoolik Subdistricts in 1961. Most of the early interest involved chinook and coho salmon which were flown in dressed condition to Anchorage for further processing. A single U.S. freezer ship also purchased and processed chum and pink salmon during 1961. In 1962, two floating cannery ships operated in the district and the commercial fishery was extended into the Norton Bay, Moses Point and Golovin Bay Subdistricts. The peak in salmon canning operations occurred during 1963.

Since then, markets have been sporadic and some subdistricts have often been unable to attract buyers for entire seasons. A joint venture between KEG (Koyuk-Elim-Golovin) Fisheries and NPL Alaska, Inc., operated from 1984 until mid-season in 1988. A permit issued by the Governor allowed two Japanese freezer ships to buy directly from domestic fishermen and was limited to salmon caught in the internal waters of Golovin and Norton Bays. Currently, the most consistent markets are at Unalakleet and Shaktoolik where fish are purchased, iced, and flown directly to Anchorage for processing and resale.

The commercial salmon fishing season opens by emergency order between June 8 and July 1, depending on run timing within each subdistrict. The season closes by regulation on August 31 in

Subdistricts 1, 2, and 3, and on September 7 in Subdistricts 4, 5, and 6, but processors often terminate their operations prior to the regulatory closure dates. Two 48 hour fishing periods normally occur each week unless changed by emergency order with the exception of the Nome and Moses Point Subdistricts, where two 24 hour fishing periods are scheduled each week.

Commercial fishing gear is restricted to set gillnets, with a maximum aggregate length of 100 fathoms allowed for each fisherman. There are no mesh size or depth restrictions during the normally scheduled periods. The majority of the gillnets fished are approximately 5 3/4 inch stretched measure. In the Unalakleet and Shaktoolik Subdistricts, 8 1/4 inch stretched mesh gillnets are commonly used during the chinook salmon run in June through early July. During years when large pink salmon runs occur, the Department provides fishing periods when only 4 1/2 inch mesh nets or less may be set or drifted. These special small mesh periods are an attempt to target pink salmon without over harvesting the larger sized salmon species.

Most fishermen do not tend their nets continuously once they are set, leaving them unattended overnight. Fish quality suffers due to the length of time fish may be left in the nets and is especially poor when storms prevent fishermen from checking their gear for extended periods of time.

Commercial Fishery Management

The Norton Sound District is managed on the basis of comparative commercial catch data, escapements and weather conditions. A single factor or combination of factors may result in issuance of emergency orders affecting seasons, fishing periods, allowable mesh size, and areas.

Aerial surveys are used to monitor escapements in the majority of the Norton Sound streams. Weather conditions, time of day, type of aircraft, water conditions, bottom conditions, date of survey, and efficiency of the surveyor and pilot must be taken into account when making inter-annual aerial survey comparisons. Counting towers are a much more consistent and accurate method of obtaining escapement information and have been utilized on many river systems in Norton Sound. Two counting towers were operated in 1993, one on the Kwiniuk River in the Moses Point Subdistrict and on the Nome River in the Nome Subdistrict. The Kwiniuk Tower has been operated since 1965 while 1993 was the first season that Nome Tower was operated.

Commercial fishing starts for chinook salmon in mid June, emphasis switches to chum salmon around June 25, then gradually shifts to coho during the third week in July. Pink salmon are abundant during even years, but there is often no market. The southern Subdistricts 5 and 6 (Shaktoolik and Unalakleet) have maintained commercial fisheries. They target chinook, chum, and coho salmon, with chinook and coho salmon catches remaining fairly stable while chum salmon catches have been declining since the early 1980's. Management has consisted of a series of Emergency Orders that open the season, adjust fishing time, restrict mesh size, and occasionally eliminate a fishing period.

Commercial fisheries in Subdistricts 2 and 3 (Golovin and Moses Point) target chum salmon. The commercial chum salmon harvest has dropped dramatically since the mid 1980's. Poor returns has

caused very restrictive management actions during recent years when the seasons have been closed by E.O. to allow for escapement and subsistence needs.

There has been little or no commercial salmon harvests in Subdistricts 1 and 4 (Nome and Koyuk) since the early 1980's. In the Nome Subdistrict this is due to very depressed stocks which in some years require closure or severe restrictions on the fishery. Conversely, the Koyuk Subdistrict has healthy stocks but can't attract markets willing to operate in this remote area.

Salmon management has changed significantly during recent years due to limited market conditions and marginal returns of many salmon stocks within the district. The Eastern subdistricts, Norton Bay, Shaktoolik, and Unalakleet all have relatively healthy salmon stocks. Commercial fishing in these subdistricts is managed using commercial fishing statistics and the Unalakleet River test fishing escapement index. Both the Golovin and Moses Point Subdistricts have recently suffered from poor chum salmon returns. In these two subdistricts, management first insures an adequate escapement, then a subsistence harvest within historical levels and finally an attempt is made to provide for a commercial and sport harvest. The Nome Subdistrict is managed intensively for subsistence use. Registration permits, closed waters, setting fishing period length, limiting gear and harvest limits are all tools that can be employed throughout the season to provide for escapement needs and to maximize subsistence opportunity.

Subsistence Fishery Overview

Household subsistence surveys had not been conducted district wide since 1985 in Norton Sound villages due to budgetary restrictions. The Subsistence Division has been selecting one village each year in which to conduct formal indepth studies of subsistence harvest levels and trends. The information is not used for inseason management, but identifies subsistence needs which must be considered in management decisions. In 1994 and 1995, the Department initiated a new subsistence salmon harvest assessment effort in Northwest Alaska. In 1995, households in eight of the 12 communities in the Norton Sound District were surveyed. The Division of Commercial Fisheries Management and Development funded the household surveys and the Division of Subsistence collected and analyzed the data. The Bering Sea Fishermen's Association provided funding for local village researchers to assist with data collection.

Daily surveys of Unalakleet River and ocean subsistence fishermen have been conducted annually since 1985 during the chinook salmon run. Although total harvests by subsistence fishers were not documented, effort and catch information were used to judge timing and magnitude of the chinook salmon return. The commercial fishery is delayed until it becomes apparent subsistence needs are being met and chinook salmon are beginning their upstream migration as indicated by the Department of Fish and Game test net in the lower Unalakleet River. There is a growing trend to move subsistence nets from the river mouth out to the ocean in order to avoid large debris loads from spring runoff. It is presently unclear what changes this fishing technique will have on chinook salmon escapement.

Low salmon stock levels in the Nome Subdistrict combined with a large concentration of users has required issuing subsistence harvest permits for the area since 1974. These are issued by regulation to each household and designated fishing location. Each location may have its own catch limit per permit and the fisherman is allowed to change locations after notifying the local Fish and Game office.

Regulatory Actions in Nome Subdistrict

Although pink salmon are usually the most abundant species of salmon in Subdistrict 1 streams, the commercial fishery has targeted chum salmon. The relatively large chum salmon catches in this subdistrict in conjunction with weak local stock abundance implied that the fishery intercepts non-local stocks. A 1978-79 Norton Sound stock separation study confirmed this view. Salmon tagged near Nome were re-captured in fisheries from Golovin (Subdistrict 2) to Kotzebue. In an attempt to provide for spawning requirements in addition to an important subsistence fishery that targets local stocks, a commercial harvest guideline of 5,000-15,000 chum salmon was adopted as a regulation.

Due to poor chum salmon escapement during the 1982 and 1983 seasons, the Board of Fisheries, in response to an advisory committee petition, directed the Department to manage the commercial fishery so that chum salmon escapement could be optimized. During the 1984 fall Board of Fisheries meetings, these directives became regulation. In response to public and advisory board proposals, the following commercial fishery restrictions were adopted as regulations:

- 1) Salmon may be taken commercially only from July 1 through August 31.
- 2) Fishing periods were restricted to two 24 hour periods per week.
- 3) Waters west of Cape Nome were closed to commercial salmon fishing.

The Department was also directed to allow a harvest at the lower end of the guideline harvest range of 5,000 to 15,000 chum salmon, as stipulated in 5AAC 04.360.

In addition to these commercial fishing restrictions, a proposal to restrict the sport fishery in the Nome and Snake Rivers was adopted in 1984:

With a bag and possession limit of 15 salmon, other than chinook salmon, only 5 could be chum and coho salmon, in combination.

Subsistence permit limits in the Nome and Snake Rivers were restricted to 20 chum and 20 coho salmon. The remainder of the permit limit could be filled with salmon other than chum or coho salmon.

However, even with these restrictive regulations in place, chum salmon escapement goals were difficult to attain. The 1987 fishing season experienced poor returns of both chum and pink salmon to Nome Subdistrict streams. Numerous management actions were made which curtailed commercial fishing activities, and later, sport, personal use, and subsistence were also restricted. Even with such drastic

fishery restrictions, escapement goals for chum salmon were not attained during 1987 in the Nome, Eldorado, Flambeau, Bonanza, Snake, and Solomon Rivers. In response to this continuing trend of decreasing chum and pink salmon returns to the Nome Subdistrict, several new regulations were adopted during the 1987 Alaska Board of Fisheries meetings.

With the commercial fishery all but eliminated in recent years, proposals affecting the sport, personal use, and subsistence fisheries were considered. The following new sport fish regulations were adopted for all Nome area road system streams (Seward Peninsula drainages from Cape Prince of Wales to Cape Darby):

- 1) For salmon other than chinook, 10 per day, 10 in possession, only 3 which may be chum salmon and coho salmon, in combination.
- 2) For chinook salmon, 1 per day, 1 in possession.

These new regulations superseded those adopted during 1984. Additional new regulations affecting personal use and subsistence fishermen which were adopted in 1987 included:

- 1) In the Nome River, no person may operate more than 50 feet of gillnet in the aggregate.
- 2) The Nome River was added to the regulation 5AAC 01.170 (e) which states that small mesh gillnets (less than 4 1/2 inch mesh) and beach seines may not be used in specific Nome Subdistrict streams.

Regulation changes in 1992 restricted the use of beach seines in the Nome subdistrict. The managers now have the authority to allow the subsistence harvest of chum or pink salmon by beach seine if escapement needs are likely to be met. Beginning in 1991, no chum salmon harvests have been allowed until escapement goals were likely to be met or conservative management actions were judged to be no longer effective. In the past beach seines were viewed as an overly effective means to harvest fish, but during the last two years, beach seines were used as a means to harvest abundant species, while allowing the live release of other species experiencing depressed runs.

1995 Norton Sound Salmon Fishery

Commercial Fishery Summary

The 1995 Norton Sound District commercial salmon fishing season was first opened by emergency order in the Unalakleet and Shaktoolik Subdistricts on June 12 and ended by regulation on August 25. The commercial salmon harvest totaled 181,392 fish which was comprised of 8,860 chinook, 128 sockeye, 47,862 coho, 81,644 pink, and 42,898 chum salmon (Table 1). Approximately 105 permit holders participated in the fishery and received \$356,912 for their catch (Table 2 and 3).

Table 1 lists the Norton Sound historical salmon and the current year commercial harvests relative to the previous 5 year (1990-1994) and the previous 10 year (1985-1994) averages. The chinook salmon harvest was 31% above the previous 5 year average and 15% above the previous 10 year average. The coho salmon harvest was 36% below the previous 5 year average and 10% below the previous 10 year average catches. Historically Norton Sound has had very limited, but sporadic markets for pink salmon have occurred. A new market for pink salmon opened in 1994. Given the availability of markets and the projected run size, the 1995 pink salmon harvest was expected to total approximately one half million fish. The 1995 return was weak and resulted in a pink salmon harvest that was less than 20 percent of expectations. The chum salmon commercial harvest was 30% below the 5 year average and 49% below the 10 year average catches for Norton Sound.

A total of 172 CFEC permits were renewed, of which 105 actually fished during the 1995 season which is the new record low (Table 2). The number of participating fishermen this season was 24% below the previous 10 year average of 138. Low effort levels typically occur when there is a drop in salmon returns or when prices are low. The northern subdistricts had historically landed approximately 50% of the total commercial chum salmon harvest, but did not participate during that portion of the season due to chum restrictions. In addition, participation in the pink salmon fishery was minimal due to the low pink returns.

Two primary salmon buyers operated in Norton Sound during the 1995 season. One buyer purchased fish during the chinook and coho salmon seasons while the other buyer was interested in pink salmon. The chinook and coho salmon were delivered at Unalakleet and Nome using tenders and aircraft. The fish were headed and gutted then shipped air freight to markets. The other buyer, which purchased pink salmon, tendered fish throughout Norton Sound to their processing vessel located along the eastern coast. The floating processor custom processed the pink salmon using pollock filet and packaging machines then held the product onboard. Some of the product from the chinook and coho salmon purchased by the shore based company was also held on the freezer vessel. In addition, a few individual fishermen sold their catch of fresh salmon locally and to wholesale distributors, as permitted under catcher-seller status. The average price paid for chinook was \$.66 per pound, \$.50/lb. for sockeye, \$.43/lb. for coho, \$.18/lb. for pink, and \$.18/lb. for chum salmon. The total value of the raw fish, \$356,912, was 30% below the previous 5 year (1990-1994) average (Table 3).

The 1995 Salmon Management Plan for Norton Sound dictated that the chum salmon harvest was to be held to one-half the historical levels due to conservation concerns. Consequently, chinook salmon were targeted early in the season using minimum mesh size restrictions which were intended to minimize chum catches. As the season progressed, chinook salmon returns were above average and early indications were that good numbers of chum salmon were escaping into most Norton Sound rivers. The chum salmon market was very limited. Fish buyers were prepared to purchase some chum salmon, but had to choose between buying early, good quality chum and buying a later, lesser quality chum caught incidentally in the later pink and coho salmon fisheries; thereby, maximizing the pink and coho harvests.

Mesh restrictions were briefly relaxed to allow for some chum salmon harvest in the southern subdistricts before the market switched to pink salmon. Maximum mesh size restrictions and special harvest areas were used to target the pink salmon which returned much weaker than expected. Commercial fishing was closed for several periods between the end of the pink salmon fishery and prior to the coho salmon fishery. Chum salmon were still running, but their quality was declining. Commercial fishing resumed once the coho salmon return began to build and coho salmon predominated in the commercial catch. At that point, the chum salmon escapements were known to have been met and the fish buyers had relatively few water marked chum salmon to accept. The commercial salmon season closed early as it became apparent that the coho salmon return was below average. A reduction in commercial harvest was necessary to attain desired coho escapement levels.

Subsistence Fishery Summary

A summary of the subsistence salmon harvest estimates by community and subdistrict is presented in Table 9. The estimated subsistence harvest in Norton Sound for 1995 was 113,612 fish. Of these, 7,766 were chinook salmon, 43,014 were chum, 38,594 were pink, 1,222 were sockeye, and 23,015 were coho. Estimated mean salmon harvest was 133 salmon per household (9 chinook, 51 chum, 45 pink, 1 sockeye, and 27 coho). In the eight communities surveyed in Norton Sound, 71 percent of households fished for subsistence salmon in 1995. Sixty-four percent of households responded "yes" when asked whether their salmon needs had been met in 1995. An estimated 5,048 salmon were harvested for dog food.

Daily interviews of Unalakleet River and ocean subsistence fishermen were conducted at Unalakleet during the early portion of the fishing season in order to monitor the chinook salmon return. Total harvests by subsistence fishermen were not documented, however effort and catch information was used, in combination with the Department's test net in the lower Unalakleet River and commercial catch information, to judge the timing and magnitude of the chinook salmon return. This information was the basis for scheduling early commercial salmon fishing periods in the Unalakleet and Shaktoolik Subdistricts. Commercial fishing is typically only allowed after chinook salmon have been observed entering the Unalakleet River in increasing numbers for a

week's time to assure the harvest is directed on a actively migrating local stock and not on milling fish.

Subsistence fishing permits are required by regulation for each household that fishes in the Nome Subdistrict. These permits identify the body of water to be fished, the type of gear used, and the bag limit which is specific to that body of water. In addition the permit contains a catch calendar where the permit holder records catches in numbers of each species of fish for each day fished. If the subsistence fishers have filled their bag limits or would like to fish another location, they can be issued another permit generally for another area after the previous one has been returned. These permits are important for management because they identify users and bag limits, but the actual catch information can not be compiled until well after the season when the permits are returned to the Department of Fish and Game. This information will also be presented in a later report.

Season Summary by Subdistrict

Nome - Subdistrict 1. The commercial salmon season in the Nome Subdistrict was opened by Emergency Order (E.O.) on August 3. This management action which delayed the season was taken in order to avoid the harvest of chum and pink salmon that were expected to return in low numbers to the subdistrict. Sport fishing for chum salmon is closed by regulation in the subdistrict and subsistence fishing was closed prior to the beginning of the chum salmon return for nearly the entire area except in marine waters east of Cape Nome which actually had increased fishing time over recent years.

Subsistence fishing restrictions were incrementally relaxed on a stream-by-stream basis as chum salmon escapements appeared certain to be met. Chum salmon returns to the streams east of Cape Nome were strong, while the pink salmon returns were much lower than expected, for an odd year return which are significantly smaller than even year returns. On July 17, an Emergency Order was announced that allowed the use of beach seines with the condition that all pink salmon had to be released. This enabled fishermen to take advantage of the more abundant chum salmon in several streams while protecting the weaker pink salmon return.

As stated above, the Nome Subdistrict opened for a directed commercial fishery on coho salmon beginning August 3. Only two fishermen reported sales. The reason for the low effort was due to typical poor weather conditions during August and low salmon abundance. Like other Norton Sound streams, rivers in the Nome Subdistrict experienced poor coho salmon returns. An Emergency Order issued on August 24, closed commercial fishing in the subdistrict. Additionally, sport fishing for coho salmon and subsistence fishing were closed on August 25 in the Nome area to help bolster coho salmon escapements. Subsistence fishing reopened on September 16. The total commercial harvest for the subdistrict included 1 sockeye, 369 coho, and 122 chum

salmon (Table 2 and 5). One hundred nineteen subsistence permits were issued for the Nome area.

Golovin - Subdistrict 2. Over the last six years, chum salmon stocks in the Golovin Subdistrict have received little or no commercial exploitation and still have not made spawning escapements in some years. The 1995 Salmon Management Plan informed fishermen that the Golovin Subdistrict commercial harvest would be limited to a maximum of 10,000 chum salmon before July 10 in an attempt to insure an adequate chum salmon escapement. By that date, the chum salmon run would be assessed and fishing time would be adjusted accordingly. The planned pink and coho salmon fisheries were expected to have an incidental chum salmon harvest, therefore the salmon buyer and the salmon fishermen decided not to jeopardize the pink and coho salmon fisheries with an early harvest of chum salmon. Both the pink and coho salmon fishery were thought to be potentially more lucrative than the chum salmon fishery.

An Emergency Order issued July 17 opened the Golovin Bay Subdistrict to a schedule of three 24 hour periods per week and limited mesh size to pink gear only. The subdistrict was closed to commercial fishing on July 24 at the request of the salmon buyer. Commercial fishing reopened on July 31 to a three 24 hour period per week schedule with a maximum mesh size restriction of six inches to target coho salmon. Fishing schedules were changed on two occasions to accommodate tender logistics. Fishing time also increased slightly to two 48 hour periods per week since effort had dropped off.

Commercial fishing was closed on August 26 when it was apparent that coho salmon escapements would be low. Seven fishermen made deliveries for a total commercial harvest of 1,616 coho, 4,296 pink and 1,987 chum salmon (Table 2 and 6). The pink salmon were tendered to a floating processor near Shaktoolik and the coho salmon were flown to Nome by small aircraft for processing.

Moses Point - Subdistrict 3. The Moses Point Subdistrict chum salmon return has also experienced a decrease in size in recent years despite conservative management actions. The salmon management plan stated that there was to be no chum salmon directed commercial fishery with the possibility of a subsistence closure during the run if the chum escapement levels appeared certain to fall short of the Kwiniuk River counting tower goal of 19,500 chum salmon. Commercial fishing was to remain closed through June and July to protect the chum salmon stocks with the exception of a possible pink salmon directed fishery. If chum salmon levels were low, attempts would be made to minimize the impact on the subsistence harvest by allowing directed fishing on other salmon species. The return was closely monitored throughout the run at the Kwiniuk River counting tower.

The chum salmon return arrived early and strong, but as a result of conservative management and lack of market, no directed fishery occurred. The preseason management plan prescribed a limited pink salmon directed fishery in the subdistrict. The

pink salmon return was expected to be low, but the plan was to allow a limited harvest from each subdistrict thereby keeping the interest of the fledgling pink salmon market while minimizing the impact to a weak return. However, when the pink salmon run returned weaker than expected, some fishers became concerned about their subsistence fishery. A village meeting was held at Elim and was attended by the Department of Fish and Game staff, the salmon buyer, and both commercial and subsistence fishermen. An agreement was reached and a pink salmon directed commercial fishery was opened July 17 on a weekly schedule of three 24 hour periods per week with boundary restrictions that moved commercial fishing away from the subsistence use area and to maintain product quality.

Fishing was also closed in the Moses Point Subdistrict on July 24 because of low pink salmon returns and then reopened on July 31 to target coho salmon. The subdistrict made fishing schedule changes similar to the Golovin Subdistrict, two schedule changes and one fishing time increase as a result of low effort and a seemingly adequate coho salmon escapement. However, the subdistrict was closed August 26 when it became obvious that the coho return was below average.

The Moses Point total harvest taken by 12 fishermen included 4 chinook, 44 sockeye, 3,742 coho, 2,962 pink, and 1,171 chum salmon (Table 2 and 7). The coho catch was 32% below the previous 5 year average (1990-1994) and 30% below the previous 10 year average (1985-1994). The chum salmon harvest was low at 15% above and 86% below the previous 5 and 10 year averages. The last significant chum salmon harvest in the Moses Point Subdistrict was taken in 1988.

Norton Bay - Subdistrict 4. The Norton Bay Subdistrict has always had difficulty attracting a buyer due to its remoteness and its reputation for water-marked fish. Consequently, a regulatory change became effective in 1995 that moved the western boundary from Six Mile Point to Isaac's Point which was intended to improve fish quality. Partially as a result of minimal fishing in recent years and alternative employment in construction, there was little interest in commercial fishing and no buyers operated in the subdistrict in 1995. Due to lack of timely salmon escapement information the Norton Bay Subdistrict is managed similar to the Shaktoolik and Unalakleet Subdistricts because they reflect similar trends in salmon return strength and timing.

The subdistrict opened on June 12 to target chinook salmon using a 7.5 inch minimum mesh restriction for one 24 hour period even though there was no buyer in order to provide an opportunity for fishermen to locate a market. On June 15, fishing time was set on a standard schedule of two 24 hour periods per week with chinook gear only and was increased to two 48 hour periods per week on June 20 because the chinook return appeared strong. The fishery was expanded to unrestricted mesh size on June 29 to open up the potential harvest since no commercial landings had been made in the subdistrict. On August 19, the subdistrict was closed for the season to maintain an orderly fishery. All

other subdistricts in Norton Sound were closed, the coho salmon run was well past its peak, and nobody expressed an interest in fishing in the subdistrict. This was the fifth time in the last ten years that no landings had been made in the Norton Bay Subdistrict and the last significant harvest was taken in 1988.

Shaktoolik and Unalakleet - Subdistricts 5 and 6. Both the Shaktoolik Subdistrict and the Unalakleet Subdistrict, which share a common boundary, consistently attract commercial markets due to greater fish abundance and better transportation services. Management actions typically encompass both subdistricts because salmon stocks tend to intermingle and harvest in one subdistrict, affects the availability of fish in the adjacent subdistrict. As stated earlier the department's test net in the Unalakleet River and subsistence interviews at Unalakleet are used to set early fishing periods in both subdistricts. As the season progresses, the test net and commercial catch indices are used to assess return strengths of each salmon species. Aerial surveys are frequently not obtained in either subdistrict due to poor survey conditions and are used as a late assessment check because of the long travel time between the fishery and the spawning grounds (Table 4).

The first fishing period in both subdistricts opened on June 12 and ran 24 hours. It was directed at chinook salmon using a minimum mesh size restriction of 7.5 inches. On June 15, both subdistricts went to a standard schedule of two 24 hour periods per week. Fishing time was increased to two 48 hour periods per week on June 20 because the chinook salmon return continued to look strong, the chum salmon return was building, and the pink salmon return was expected to be low. On June 29, unrestricted fishing gear mesh size was allowed as the chum and pink salmon migration was advancing. A buyer was willing to purchase chum and pink salmon. Gear restrictions were rescinded as they were no longer necessary for conservation or to direct fishermen to a particular species. Fishermen shifted from chinook to chum salmon gear.

On July 10, the fishery began targeting pink salmon. The chum salmon market had declined and the fish processor was interested in pink salmon even though the pink salmon return was expected to be weak. The management plan stated the department's intent to distribute the pink salmon fishery over subdistricts 2, 3, 4, 5, and 6 in an effort to avoid over harvest in any one particular watershed. Fishing time changed to three periods per week, two 24 hour periods and one 36 hour period. Gear was restricted to a 4.5 inch maximum mesh size. These actions allowed the processor time to move his tender throughout Norton Sound and to limit the take of the less desired chum salmon. Both the Shaktoolik and Unalakleet Subdistricts were closed on July 17 to commercial fishing. The pink salmon return was continuing to build, but escapements were minimal. By closing prior to the peak, the pink salmon return entering the rivers could still provide for adequate subsistence harvests and escapements.

Both subdistricts reopened on July 24 for a single 48 hour period with gear restricted to a maximum mesh size of 6 inches in order to provide an early assessment of the building coho salmon migration. The coho catch was low and the chum catch was high. Fishing remained closed until July 31 when it was opened to the standard schedule of two 48 hour periods per week. Fishing schedules were changed twice to allow the tender to adjust to time changes in other subdistricts. The coho salmon migration continued to build, but commercial catches and escapement indices were below normal. Both the Shaktoolik and Unalakleet Subdistricts closed for the season on August 26. Early in the coho salmon run, fisheries management was optimistic since predictions were for a strong return. However, there was no late pulse of fish as evidenced by the department's test net and aerial surveys. The late season closure was intended to bolster escapement by allowing the remainder of the coho salmon migration to enter freshwater.

Commercial catches in the Shaktoolik Subdistrict included 1,239 chinook, 5 sockeye, 10,855 coho, 37,377 pink, and 14,775 chum salmon (Table 2 and 8). The chinook salmon harvest was 29% below the previous 5 year average and 36% below the previous 10 year average. The coho salmon harvest was 15% below the previous 5 year average and 14% above previous 10 year average. The pink salmon harvest varies widely from year to year due to markets and the cyclic nature of the species. The 1995 harvest of pink salmon was 69% below the 5 year average and 39% below the 10 year average. Chum salmon were targeted for only three periods and were incidentally caught during other directed fisheries. The total chum salmon harvest was 31% below the 5 year average and 23% below the 10 year average harvest.

The Unalakleet Subdistrict had similar catches and trends. The harvest included 7,617 chinook, 78 sockeye, 31,280 coho, 37,009 pink, and 24,843 chum salmon (Table 2 and 9). The chinook salmon catch was 57% above the previous 5 year average and 33% above the previous 10 year average. Again, the coho salmon harvest in the subdistrict was 45% and 21% below the previous 5 and 10 year averages. The pink salmon harvest was also low at 65% below the 5 year average and 33% below the 10 year average. The total chum salmon harvest in the Unalakleet Subdistrict was low at 21% below the previous 5 year average and 10% below the previous 10 year average.

Escapement

Table 4 lists aerial survey and tower escapement counts in the major index streams of Norton Sound. Survey conditions were fair to good throughout the entire district in 1995 which allowed peak aerial surveys for most streams for each species. The Nome Subdistrict streams received the most intensive survey efforts because salmon stocks local to the Nome area are limited, easily accessed by road system, and can be exposed to subsistence and sport fishing pressure.

Department escapement projects in the Norton Sound District include counting towers on the Kwiniuk, Nome, and Niukluk Rivers and a test net at Unalakleet River. Both the Unalakleet test

net and the Kwiniuk tower projects have been in operation for many years. They provide comparable and timely information which is used as a basis for inseason salmon management decisions. The Nome River tower first began in late 1993 and was operational throughout 1995 while the Niukluk tower became functional in 1995. Both projects have limited historic data that can be used when making comparisons, but will become more valuable the longer they operate.

Two additional counting tower projects were also operated in the Nome area this season. The Snake River project was setup and operated by Kawarak Corporation who received BIA pass-through money to run the project. The other counting tower was located on the Eldorado River and was funded by the Sitnasuak Corporation. Both projects ran as cooperative ventures with the Department of Fish and Game who supplied technical support. The projects supplied daily information to the department that was very useful to management of local salmon resources.

Chinook Salmon. The Unalakleet and Shaktoolik Subdistricts are the primary chinook salmon producers in Norton Sound. Although on a smaller scale, the Norton Bay, Moses Point and Golovin Subdistricts have experienced a gradually increasing trend of chinook returns in recent years. Daily subsistence fishermen interviews conducted at Unalakleet, the Department's test fish project in the Unalakleet River, aerial escapement surveys, and comparative commercial catch data all indicated that chinook salmon escapements were slightly above average in the Unalakleet Subdistricts and slightly below average in the Shaktoolik Subdistrict. The Kwiniuk River counting tower had a slightly higher than average chinook salmon passage.

Chum Salmon. As stated earlier, chum salmon escapements were typically above average throughout Norton Sound in 1995. Streams in the Nome Subdistrict were surveyed with mixed results, while the counting towers indicated strong runs particularly in the Eldorado and Flambeau Rivers. Tower passage goals have not been developed for these systems. Comparative run strength of the chum salmon returns primarily from aerial survey comparisons indicate that the Snake and Nome Rivers were close to their escapement goals while the Eldorado and Flambeau Rivers exceeded their goals by nearly 100%. The Sinuk River chum salmon escapement was found to be roughly 70% of the goal and the Solomon River chum salmon escapement was less than 60% of the goal.

The Golovin Bay Subdistrict is primarily a one river system with individual escapement goals set for individual tributaries. Aerial surveys this season put the chum salmon escapement at 54% above the escapement goal for the combined system. Again, the Niukluk River counting tower does not have a comparative data base, but did document a substantial number of chum salmon past the tower which tends to confirm that chum salmon escapement to the subdistrict was good.

The Moses Point Subdistrict had good chum escapements as documented by the Kwiniuk River counting tower which had an expanded count of 42,161 chum salmon pass the tower. This was 116% above the tower passage goal of 19,500 chum salmon and was the highest escapement since 1984. The Tubutulik River which is also a major stream in the

Moses Point Subdistrict, had an aerial count that was also the highest since 1984. Only one stream in the Norton Bay Subdistrict was surveyed and exceeded its goal by 5 times; this was a new record. The subdistrict was assumed to have had good chum salmon escapements. Aerial surveys in the Unalakleet and Shaktoolik Subdistricts are not consistently obtained each year, but counts in 1995 were in the average range while the test net in the Unalakleet River had the highest chum salmon total since 1981. Therefore it is believed that both subdistricts had adequate chum salmon escapements.

Coho Salmon. Coho salmon are found in nearly all of the chum salmon producing streams throughout Norton Sound with the primary commercial contributors being the Unalakleet and Shaktoolik Rivers. Because inclement weather is normally experienced in this area during August and September, escapement data for all subdistricts frequently cannot be obtained. Streams in the northern subdistricts of Norton Sound are consistently surveyed. The Unalakleet River test net has the best data set to compare coho salmon escapement in eastern Norton Sound. Counting towers in the northern subdistricts generally do not operate during the coho salmon migration due to budget restrictions. In 1995, both the Nome and Niukluk River counting towers were operational through the coho run.

Overall, coho salmon escapements appeared to be average to below average. The Nome Subdistrict coho escapements were below average. The Golovin Bay, Moses Point, Shaktoolik, and Unalakleet Subdistrict all had average coho salmon escapements. The Norton Bay Subdistrict was not surveyed, but since no commercial fishery occurred with only limited subsistence harvest, it is assumed that escapements were adequate.

Pink Salmon. During recent years, pink salmon returns to Norton Sound have followed an odd/even year cycle with the even years typically much larger than the odd years. The 1995 pink salmon return was considerably less than expected for an odd year return throughout Norton Sound. Aerial survey data obtained for most index streams, was supplemented with tower counts, commercial catch data, Unalakleet test net data, and anecdotal data suggested that the low pink salmon return was widespread and below expectations.

Management Concerns

Chum salmon stocks have declined throughout Norton Sound over the past six or seven years with escapements in the northern subdistricts continuing to be a major concern. Chum salmon escapements have consistently fallen short of goals even at times when all forms of harvest have been drastically reduced or eliminated. The Nome Subdistrict was closed in 1995 during nearly the entire chum salmon run to sport and commercial fishing. Subsistence fisheries management actions included requiring intense management on a stream-by-stream basis. The Golovin and Moses Point Subdistricts both exceeded their escapement goals and could have supported harvests approaching typical commercial levels of 20,000 to 40,000 for each. Likewise, both the Shaktoolik and Unalakleet Subdistricts had below average commercial catches with adequate escapements. The 1995 chum salmon returns were better than expected, but less than the average historical returns. Escapement goals were obtained for most index streams, but chum harvest will continue to be managed conservatively as returns can be expected to be low for the next several years since the returns will be coming from low parent years.

The renewed interest in Norton Sound pink salmon commercial fishing has proven feasible and manageable on strong year classes, but is questionable during weak return years. Management Plans will have to be developed that set exploitation levels and escapement needs, gear and harvest requirements, and consider incidental weak stock impacts.

Salmon marketing conditions has become a significant factor for consideration when scheduling fishing periods. Market conditions have caused more restrictive limitations than biological factors in recent years for many species. Purchasers frequently notify the Department of Fish and Game that they can only handle a limited quantity with a high quality standard and at a specific rate to optimize their operations. The manager must not only monitor the salmon returns and harvest rates, but must coordinate schedules with the salmon buyers to maintain the limited markets available for Norton Sound salmon.

1996 Outlook

Salmon forecasts and harvest projections for the 1996 commercial salmon season are based on qualitative assessments of brood year returns, subjective determinations of freshwater overwintering and ocean survival, and projections of local market conditions. Salmon buyers probably will not operate in all of the Norton Sound subdistricts during 1996. The chinook return is expected to be average with a commercial harvest ranging from 5,000 to 8,000 fish. The often uncertain pink salmon market is expected to be present in 1996. However, the record parent year class which returned to spawn in 1994 was followed by a catastrophic flood event that likely reduced egg survival. Consequently, the pink salmon return for 1996 will be unpredictable with a potential harvest that could vary widely from 100,000 to 1 million fish. The 1996 chum salmon return is expected to be about average while the market for Norton Sound chum will likely be weak. The commercial harvest of chum salmon will be managed conservatively with an expected total catch between 40,000 and 80,000. The 1992 coho salmon commercial harvest and

escapements indicate that the 1996 coho return will be above average and the commercial harvest is expected to range from 50,000 to 80,000 fish.

WRSO

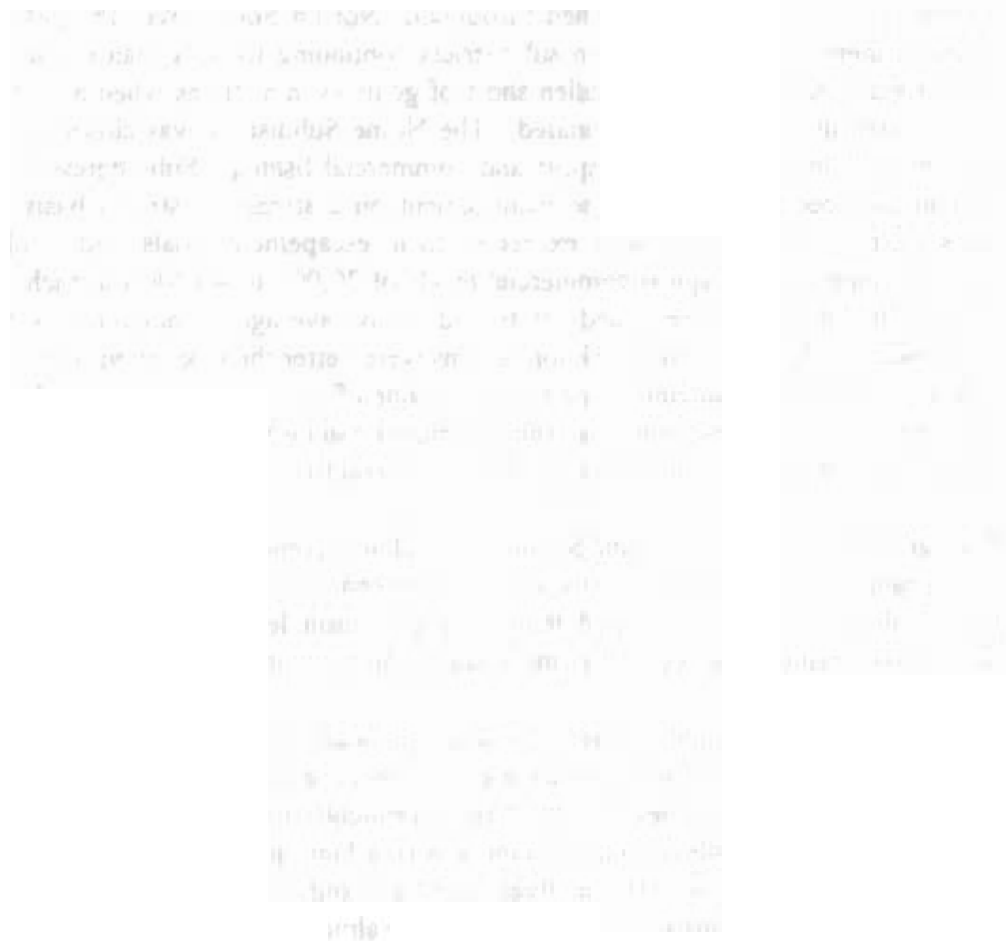


Table 1. Norton Sound commercial salmon catch by subdistrict, 1995.

Subdistrict	Chinook	Sockeye	Coho	Pink	Chum	Total
Norne	0	1	869	0	122	492
Golovin	0	0	1,616	4,296	1,987	7,899
Moses Point	4	44	3,742	2,962	1,171	7,923
Norton Bay	0	0	0	0	0	0
Shaktoolik	1,239	5	10,855	37,377	14,775	64,251
Unalakleet	7,617	78	31,280	37,009	24,843	100,827
District Totals	8,860	128	47,862	81,644	42,898	181,392

Table 2. Nome area subsistence salmon catches, Norton Sound, 1995 (as of 1/12/96).

	Number of Permits			Number of Salmon Harvested					
	Issued	Returned	Fished	Chinook	Sockeye	Coho	Pink	Chum	Total
Marine Waters	77	53	37	22	145	911	293	3,042	4,413
Nome River	8	8	5	1	2	97	9	31	140
Snake River	2	1	1	0	0	6	3	2	11
Eldorado River	10	7	6	2	1	304	0	500	807
Flambeau River	5	5	4	1	0	47	1	199	248
Bonanza River	4	3	1	0	0	0	30	20	50
Safety Sound	0	0	0	0	0	0	0	0	0
Solomon River	0	0	0	0	0	0	0	0	0
Penny River	0	0	0	0	0	0	0	0	0
Cripple Creek	0	0	0	0	0	0	0	0	0
Sinuk River	1	1	0	0	0	0	0	0	0
Feather River	0	0	0	0	0	0	0	0	0
Fish River	1	0	0	0	0	0	0	0	0
Niukluk River	1	1	1	0	0	38	0	0	38
Port Clarence	4	2	1	4	69	0	0	6	79
Kuzitrin River	1	0	0	0	0	0	0	0	0
Pilgrim River	9	7	2	0	30	6	0	0	36
Unknown River	0	0	0	0	0	0	0	0	0
Total	123	88	58	30	247	1,409	336	3,800	5,822

Table 3. Salmon survey counts of Norton Sound streams and associated chum salmon escapement goals, 1995.

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Salmon L.			5,433			
Grand Central R.			628 ^b			
Pilgrim R.		586			1,410 ^c	
Glacial L.			733			
Sinuk R.		290 ^b		1,250	3,110	4,500
Cripple R.		100 ^b		150 ^b		
Penny R.					15 ^b	
Snake R.		132 ^b			14 ^b	1,000 ^f
Nome R.		517		182	1,855	2,000 ^f
Flambeau R.		68		350	6,455	3,250
Eldorado R.		247		50	9,025	5,250 ^f
Bonanza R.		510		619		1,500
Solomon R.		105		350	315	550
Fish R.	40	1,829		780	13,433	17,500
Boston Cr.	78	230			4,221	2,500
Niukluk R.	48	2,136		200	25,358	8,000 ^f
Ophir Cr.		15				
Kwiniuk R.	468 ^d	1,625		17,573 ^d	42,161 ^d	19,500 ^e
Tubutulik R.	377	930		4,020	16,518	12,000
Inglutalik R.						8,500
Ungalik R.	32			19,700	13,475	2,500
Shaktoolik R.	270	1,665		29,680	9,060	11,000
Unalakeet R.	532	1,784 ^a		1,950	5,610	
North R.	622	690 ^a		18,300	1,370	2,000
Old Woman R.	424	818			470	100
Kogok R.	5	11 ^a		20 ^a	777 ^a	
Pikmiktalik R.	23	876 ^a		183	717	

Note: A multitude of factors affect escapement estimates. The numbers above are strict values that are instantaneous counts which may not truly represent the strength of the return. Refer to text for an evaluation of the return.

^a Counts should be considered minimums due to counting conditions.

^b Early count.

^c Late count. Chum goal for tower count.

^d Preliminary expanded tower counts.

^e Chum goal for tower count.

^f Chum goal for aerial survey.

Table 4. Commercial salmon set gillnet catches from Nome, Subdistrict 1, Norton Sound, 1995.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
				Chinook	Sockeye	Coho	CPUE	Chum	CPUE	Chinook	Sockeye	Coho	CPUE	Chum	CPUE
1 Coho	8/03-8/04	24	0	No deliveries											
2 Coho	8/07-8/08	24	1	0	0	113	4.71	97	4.04	0	0	113	4.71	97	4.04
3 Coho	8/10-8/11	24	1	0	1	75	3.13	0	0.00	0	1	188	3.92	97	2.02
4 Coho	8/14-8/15	24	2	0	0	181	3.77	25	0.52	0	1	369	3.84	122	1.27
5 Coho	8/17-8/18	24	0	No deliveries											
6 Coho	8/21-8/22	24	0	No deliveries											

No pink salmon were sold.

Total Hours fished = 144

Total number of permits used = 2

Table 5. Commercial salmon set gillnet catches from Golovin, Subdistrict 2, Norton Sound, 1995

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort							
				Chinook	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE	Chinook	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE
1 Pink	7/17-7/18	24	4	0	0	0	0	294	3.06	1463	15.24			0		294		1,463	15.24
2 Pink	7/19-7/20	24	5	0	0	4	0.03	290	2.42	1243	10.36			4		584		2,706	12.53
3 Pink	7/21-7/22	24	5	0	0	3	0.03	570	4.75	1590	13.25			7		1,154		4,296	12.79
4 Coho	7/31-8/01	24	6	0	0	204	1.42	271	1.88	0	0.00			211	1.47	1,425	9.90		
5 Coho	8/02-8/03	24	7	0	0	266	1.58	236	1.40	0	0.00			477	1.53	1,661	5.32		
6 Coho	8/04-8/05	24	4	0	0	290	3.02	192	2.00	0	0.00			767	1.68	1,853	4.54		
7 Coho	8/07-8/08	24	5	0	0	267	2.23	94	0.78	0	0.00			1,034	1.96	1,947	3.69		
8 Coho	8/09-8/10	24	3	0	0	183	2.54	6	0.08	0	0.00			1,217	2.03	1,953	3.26		
9 Coho	8/11-8/12	24	2	0	0	348	7.25	28	0.58	0	0.00			1,565	2.42	1,981	3.06		
10 Coho	8/14-8/16	48	1	0	0	51	1.06	6	0.13	0	0.00			1,616	2.32	1,987	2.85		
11 Coho	8/17-8/19	48	No deliveries											1,616	2.32	1,987	2.85		
12 Coho	8/21-8/23	48	No deliveries											1,616	2.32	1,987	2.85		
13 Coho	8/24-8/26	48	No deliveries											1,616	2.32	1,987	2.85		

Total Hours fished = 408

Total number of permits used = 7

Table 6. Commercial salmon set gillnet catches from Moses Point, Subdistrict 3, Norton Sound, 1995

Period Number	Period Dates	Hours Fished	No. of fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort									
				Chinook	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE	Chinook	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE	CPUE	
1 Pink	7/17-7/18	24	5	0	0	1	0.01	59	0.49	941	7.84	0	0	1		59		941	7.84		
2 Pink	7/19-7/20	24	6	0	0	1	0.01	215	1.49	1443	10.02	0	0	2		274		2384	9.03		
3 Pink	7/21-7/22	24	4	0	0	3	0.03	226	2.35	578	6.02	0	0	5		500		2962	8.23		
4 Coho	7/31-8/01	24	5	1	0	153	1.28	87	0.73	0	0	1	0	156	0.33	587	1.22				
5 Coho	8/02-8/03	24	4	0	0	91	0.95	41	0.43	0	0	1	0	249	0.43	628	1.09				
6 Coho	8/04-8/05	24	5	0	0	183	1.53	86	0.72	0	0	1	0	432	0.62	714	1.03				
7 Coho	8/07-8/08	24	5	0	0	465	3.88	106	0.88	0	0	1	0	897	1.1	820	1				
8 Coho	8/09-8/10	24	5	0	0	340	2.83	15	0.13	0	0	1	0	1237	1.32	835	0.89				
9 Coho	8/11-8/12	24	4	0	0	314	3.27	57	0.59	0	0	1	0	1551	1.5	892	0.86			28.84	
10 Coho	8/14-8/16	48	10	0	0	866	1.80	173	0.36	0	0	1	0	2417	1.6	1065	0.7			31.64	
11 Coho	8/17-8/19	48	5	2	11	544	2.27	22	0.09	0	0	3	11	2961	1.69	1087	0.62			29.57	
12 Coho	8/21-8/23	48	6	1	11	595	2.07	32	0.11	0	0	4	22	3556	1.74	1119	0.55				
13 Coho	8/24-8/26	48	7	0	22	186	0.55	52	0.15	0	0	4	44	3742	1.57	1,171	0.49				

Total Hours fished = 406

Total number of permits used = 12

Table 7. Commercial salmon set gillnet catches from Shaktoolik, Subdistrict 5, Norton Sound, 1995.

Period Number	Period Dates	Hours Fished	No. of fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort									
				Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE
1 King	6/12-6/13	24	7	98	0.58	0	0	0.00	11	0.07	0	0.00	98	0.58	0	0	11		0		
2 King	6/15-6/16	24	10	91	0.38	0	0	0.00	5	0.02	0	0.00	189	0.46	0	0	16		0		
3 King	6/19-6/21	48	12	344	0.60	0	0	0.00	73	0.13	0	0.00	533	0.54	0	0	89		0		
4 King	6/22-6/24	48	11	206	0.39	0	0	0.00	167	0.32	0	0.00	739	0.49	0	0	256		0		
5 King	6/26-6/28	48	12	347	0.60	0	0	0.00	418	0.73	5	0.01	1,086	0.52	0	0	674		5		
6 Chum	6/29-7/1	48	8	70	0.18	0	0	0.00	39	0.10	0	0.00	1,156		0	0	713	0.10	5		
7 Chum	7/3-7/5	48	8	47	0.12	0	0	0.00	3,426	8.92	120	0.31	1,203		0	0	4,139	4.51	125		
8 Chum	7/6-7/8	48	13	27	0.04	2	0	0.00	2,487	3.99	945	1.51	1,230		2	0	6,626	4.30	1,070		
9 Pink	7/10-7/11	24	13	6	0.02	2	0	0.00	278	0.89	8,995	28.83	1,237		4	0	7,650		10,065	28.83	
10 Pink	7/12-7/13	24	16	1	0.00	0	0	0.00	746	1.94	16,082	41.88	1,237		4	0	8,367		26,147	36.03	
11 Pink	7/14-7/15	36	15	0	0.00	0	0	0.00	717	1.33	11,230	20.80	1,237		4	0	8,367		37,377	29.38	
12 Coho	7/24-7/26	48	16	1	0.00	1	319	0.42	2,448	3.19	0	0.00	1,238		5	319	0.42	10,615	3.19	37,377	
13 Coho	7/31-8/2	48	20	1	0.00	0	1,441	1.50	1,748	1.82	0	0.00	1,239		5	1,760	1.02	12,561	2.43	37,377	
14 Coho	8/3-8/2	48	6	0	0.00	0	211	0.73	216	0.75	0	0.00	1,239		5	1,971	0.98	12,777	2.19	37,377	
15 Coho	8/7-8/9	48	16	0	0.00	0	1,817	2.37	577	0.75	0	0.00	1,239		5	3,788	1.36	13,354	1.79	37,377	
16 Coho	8/10-8/12	48	15	0	0.00	0	2,366	3.29	509	0.71	0	0.00	1,239		5	6,154	1.76	13,863	1.57	37,377	
17 Coho	8/14-8/16	48	15	0	0.00	0	2,185	3.03	534	0.74	0	0.00	1,239		5	8,339	1.97	14,397	1.43	37,377	
18 Coho	8/17-8/19	48	8	0	0.00	0	815	2.12	164	0.43	0	0.00	1,239		5	9,154	1.99	14,561	1.34	37,377	
19 Coho	8/21-8/23	48	8	0	0.00	0	531	1.38	78	0.20	0	0.00	1,239		5	9,685	1.94	14,639	1.26	37,377	
20 Coho	8/24-8/26	48	12	0	0.00	0	1,170	2.03	136	0.24	0	0.00	1,239		5	10,655	1.95	14,775	1.15	37,377	

Total Hours fished = 852

Total number of permits used = 26

Table 5. Commercial salmon set gillnet catches from Unalakleet, Subdistrict 6, Norton Sound, 1995

Period Number	Period Dates	Hours Fished	No. of fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort									
				Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Pink	CPUE
1 King	6/12-6/13	24	38	812	0.89	0	0	0.00	11	0.01	0	0.00	812	0.89	0	0		11		0	
2 King	6/15-6/16	24	33	477	0.60	0	0	0.00	22	0.03	0	0.00	1,289	0.76	0	0		33		0	
3 King	6/19-6/21	48	46	2,555	1.16	3	0	0.00	293	0.13	0	0.00	3,844	0.88	3	0		326		0	
4 King	6/22-6/24	48	32	1,838	1.20	0	0	0.00	496	0.32	0	0.00	5,682	1.04	3	0		822		0	
5 King	6/26-6/28	48	44	988	0.47	0	0	0.00	940	0.45	0	0.00	6,670	0.88	3	0		1,762		0	
6 Chum	6/29-7/1	48	26	405	0.30	0	0	0.00	1,197	0.89	0	0.00	7,075		3	0		2,959	0.89	0	
7 Chum	7/3-7/5	48	23	326	0.30	1	0	0.00	5,318	4.82	0	0.00	7,401		4	0		8,277	2.66	0	
8 Chum	7/6-7/8	48	28	125	0.09	5	0	0.00	4,697	3.49	500	0.37	7,526		9	0		12,974	2.95	500	
9 Pink	7/10-7/11	24	12	5	0.02	0	1	0.00	148	0.51	8,307	28.84	7,558		9	9		13,530		8,607	28.84
10 Pink	7/12-7/13	24	14	27	0.06	0	8	0.02	410	1.22	11,459	34.10	7,572		10	22		14,014		20,266	31.64
11 Pink	7/14-7/15	36	16	14	0.02	1	13	0.02	484	0.84	15,718	27.29	7,572		10	22		14,014		35,984	29.57
12 Coho	7/24-7/26	48	24	5	0.00	1	907	0.79	3,894	3.38	1,025	0.89	7,577		11	929	0.81	17,908	3.38	37,009	
13 Coho	7/31-8/2	48	32	7	0.00	10	3,002	1.95	2,667	1.74	0	0.00	7,584		21	3,931	1.48	20,575	2.44	37,009	
14 Coho	8/3-8/2	48	12	1	0.00	1	2,016	3.50	761	1.32	0	0.00	7,585		22	5,947	1.82	21,336	2.24	37,009	
15 Coho	8/7-8/9	48	34	6	0.00	13	4,640	2.84	981	0.59	0	0.00	7,591		35	10,587	2.16	22,297	1.69	37,009	
16 Coho	8/10-8/12	48	34	2	0.00	6	5,624	3.45	784	0.48	0	0.00	7,593		41	16,211	2.48	23,061	1.39	37,009	
17 Coho	8/14-8/16	48	33	2	0.00	4	6,355	4.01	540	0.34	0	0.00	7,595		45	22,566	2.78	23,621	1.18	37,009	
18 Coho	8/17-8/19	48	24	8	0.01	0	2,616	2.27	401	0.35	0	0.00	7,603		45	25,184	2.72	24,022	1.08	37,009	
19 Coho	8/21-8/23	48	28	10	0.01	11	3,144	2.34	489	0.35	0	0.00	7,613		56	28,328	2.67	24,491	0.99	37,009	
20 Coho	8/24-8/26	48	27	4	0.00	22	2,952	2.28	352	0.27	0	0.00	7,617		78	31,260	2.63	24,843	0.91	37,009	

Total Hours fished = 852

Total number of permits used = 58

Table 9. 1995 Norton Sound area subsistence salmon harvests.

			Chinook		Chum		Pink		Sockeye		Coho		Total	
	Total HH's	HH's Contacted	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total
Nome Permits**	107	78	26	36	3,794	5,344	336	486	148	211	1,365	1,897	5,669	7,974
Subdistrict 1	107	78	26	36	3,794	5,344	336	486	148	211	1,365	1,897	5,669	7,974
Golovin	46	42	98	106	3,899	4,235	2,707	2,940	30	33	406	441	7,140	7,755
Niukluk R. Permits**	2	1	0	0	0	0	0	0	0	0	38	38	38	38
White Mountain	67	59	59	59	6,115	6,138	4,852	4,878	1	1	1,148	1,170	12,175	12,246
Subdistrict 2	115	102	157	165	10,014	10,373	7,559	7,818	31	34	1,592	1,649	19,353	20,039
Elim	74	61	234	284	3,115	3,774	1,689	2,046	14	17	1,117	1,353	6,169	7,474
Subdistrict 3	74	61	234	284	3,115	3,774	1,689	2,046	14	17	1,117	1,353	6,169	7,474
Koyuk	71	58	406	475	4,959	5,828	3,055	3,514	41	46	868	985	9,329	10,847
Subdistrict 4	71	58	406	475	4,959	5,828	3,055	3,514	41	46	868	985	9,329	10,847
Shaktolik	54	50	1,199	1,303	2,332	2,534	6,605	7,176	66	72	2,469	2,682	12,671	13,766
Subdistrict 5	54	50	1,199	1,303	2,332	2,534	6,605	7,176	66	72	2,469	2,682	12,671	13,766
Unalakleet	234	207	2,738	3,026	3,929	4,342	14,848	16,404	535	591	8,722	9,645	30,772	34,008
Stebbins	107	90	997	1,211	4,140	5,042	631	758	169	207	2,107	2,570	8,044	9,788
St. Michael	89	74	1,045	1,267	4,766	5,778	323	391	37	45	1,844	2,235	8,015	9,715
Subdistrict 6	430	371	4,780	5,504	12,835	15,162	15,802	17,554	741	842	12,673	14,449	46,831	53,510
NORTON SOUND	851	720	6,802	7,766	37,049	43,014	35,046	38,594	1,041	1,222	20,084	23,015	100,022	113,612

* If less than 30 or 50% of households in a community were contacted, then reported harvest is used for estimated harvest.

** Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, permit returns, 1995. Expansion is by drainage.

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, household surveys, 1995.

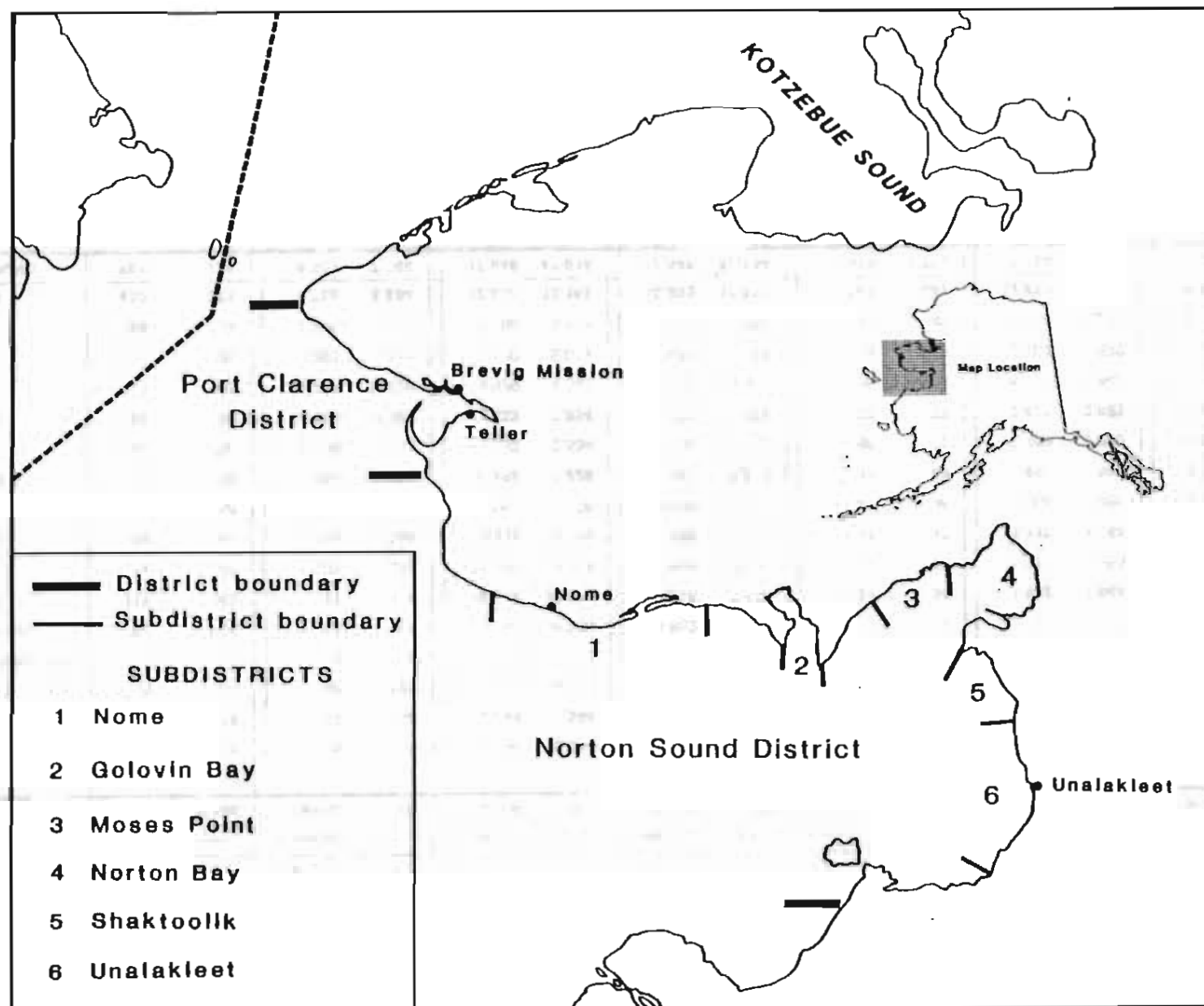


Figure 1. Norton Sound commercial salmon fishing subdistricts.

Appendix Table A1. Number of commercial salmon fishermen fishing in Norton Sound 1970-1995.

Year	SUBDISTRICT						District ^a
	1	2	3	4	5	6	Totals
1970	6	33	21	0	12	45	^b
1971	7	22	45	6	19	72	^b
1972	20	20	48	32	20	71	^b
1973	21	34	57	30	27	94	^b
1974	25	25	60	8	23	53	^b
1975	24	42	67	42	39	61	^b
1976	21	22	54	27	37	60	^b
1977	14	25	52	24	30	45	164
1978	16	24	44	26	26	51	176
1979	15	21	41	22	29	63	175
1980	14	17	26	13	26	66	159
1981	15	19	33	10	26	73	167
1982	18	17	28	10	32	68	164
1983	19	21	39	15	34	72	170
1984	8	22	25	8	24	74	141
1985	9	21	34	12	21	64	155
1986	13	24	34	9	30	73	163
1987	10	21	34	12	39	65	164
1988	5	21	36	13	21	69	152
1989	2	0	13	0	26	73	110
1990	0	15	23	0	28	73	128
1991	0	16	24	0	25	75	126
1992	2	1	21	9	25	71	110
1993	1	8	26	15	37	66	153
1994	1	5	21	0	39	71	119
1995	2	7	12	0	26	58	105

^a District total is the number of fishermen that actually fished in Norton Sound; Some fishermen may have fished more than one subdistrict.

^b Data not available

Appendix Table A2. Commercial and subsistence salmon catches by species, by year in Nome Subdistrict, Norton Sound District, 1964-1995.

NOME (SUBDISTRICT 1)																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1964	5	-	-	1	1194	1200	-	-	-	-	-	-	5	-	-	1	1194	1200
1965	1	-	-	193	1941	2135	-	-	-	780	1825	2605	1	-	-	973	3786	4740
1966	1	-	32	1	581	615	12	-	192	1794	1762	3760	13	-	224	1795	2343	4375
1967	-	-	-	72	406	478	11	-	36	349	627	1023	11	-	36	421	1033	1501
1968	-	-	-	50	102	152	7	-	108	6507	621	7243	7	-	108	6557	723	7395
1969	-	-	63	330	601	994	2	-	27	3649	508	4186	2	-	90	3979	1109	5180
1970	-	-	6	55	960	1021	-	-	35	5001	458	5494	0	-	41	5056	1418	6515
1971	11	-	-	14	2315	2340	-	-	122	5457	2900	8479	11	-	122	5471	5215	10819
1972	15	-	-	12	2643	2670	19	-	52	4684	315	5070	34	-	52	4696	2958	7740
1973	-	-	-	321	1132	1453	14	-	120	5108	1863	7105	14	-	120	5429	2995	8558
1974	19	-	123	7722	10431	18295	8	-	5	3818	183	4014	27	-	128	11540	10614	22309
1975	2	-	319	2163	8364	10848	2	-	97	6287	2858	9224	4	-	416	8430	11222	20072
1976	2	10	26	1331	7620	8889	13	-	189	5492	1705	7399	15	10	215	6823	9325	16368
1977	8	-	58	85	15998	16129	35	-	498	2773	12192	15498	43	-	556	2838	26190	31627
1978	19	-	-	22869	8782	31670	35	-	225	13063	4295	17618	54	-	225	35932	13077	49268
1979	9	-	29	5860	5391	11289	11	-	1120	6353	3273	10757	20	-	1149	12213	8664	22046
1980	8	-	-	10007	13922	23937	129	-	2157	22246	5983	30515	137	-	2157	32253	19905	54452
1981	4	-	508	3202	18666	22380	35	14	1726	5584	8579	15938	39	14	2234	8786	27245	38318
1982	20	-	1183	18512	13447	33162	21	6	1829	19202	4831	25889	41	6	3012	37714	18278	59051
1983	23	-	261	308	11691	12283	74	53	1911	8086	7091	17215	97	53	2172	8394	18782	29498
1984	7	-	820	-	3744	4571	83	16	1795	17182	4883	23959	90	16	2615	17182	8627	26530
1985	21	-	356	-	6219	6596	56	114	1054	2117	5667	9006	77	114	1410	2117	11886	15804
1986	6	-	50	-	8160	8216	150	107	688	8720	8085	17750	156	107	738	8720	16245	25966
1987	3	-	577	-	5646	6226	200	107	1100	1251	8394	11052	203	107	1677	1251	14040	17278
1988	2	-	54	182	1828	1866	63	133	1076	2159	5952	9383	65	133	1130	2341	7580	11249
1989	2	-	-	123	492	617	24	131	409	924	3399	4947	26	131	489	1047	3891	5564
1990	0	-	0	0	0	0	58	234	510	2233	4246	7281	58	234	510	2233	4246	7281
1991	0	0	0	0	0	0	83	166	1279	194	3715	5437	83	166	1279	194	3715	5437
1992	1	2	693	185	881	1762	152	163	1481	7351	1684	10831	153	165	2174	7536	2585	12593
1993	0	2	611	0	132	745	52	80	2070	873	1768	4841	52	82	2681	873	1898	5586
1994	0	1	287	0	66	354	23	69	983	6556	1673	9304	23	70	1270	6556	1739	9658
1995	0	1	369	0	122	492	36	211	1897	486	5344	7974	36	212	2266	486	5486	8486
1996	0	0	9	13	3	25	-	-	-	-	-	-	-	-	-	-	-	-
5-year avg. ^a	0	1	392	37	240	671	69	138	1542	3092	2836	7677	69	138	1934	3129	2077	8348
10-year avg. ^b	1	1	264	49	1713	2028	84	140	1155	3075	4426	8880	86	141	1419	3124	6139	10908

^a 1991-1995^b 1985-1995

GOLOVIN BAY (SUBDISTRICT 2)																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1962	45	11	264	10276	68720	79316	-	-	-	-	-	-	45	11	264	10276	68720	79316
1963	40	40	-	19677	49850	69607	-	-	118	5702	9319	15139	40	40	118	25379	59169	84746
1964	27	40	3	7236	58301	65607	-	-	-	-	-	-	27	40	3	7236	58301	65607
1965	-	-	-	-	-	-	2	-	49	1523	3847	5421	2	-	49	1523	3847	5421
1966	17	14	584	4665	29791	35071	4	-	176	1573	3520	5273	21	14	760	6236	33311	40344
1967	10	-	747	5790	31193	37740	3	-	185	2774	4803	7765	13	-	932	8564	35996	45505
1968	12	-	205	16428	10011	26656	4	-	181	4955	1744	6884	16	-	386	23383	11755	35540
1969	28	-	1224	23206	20949	45409	2	-	190	2760	2514	5466	30	-	1414	25968	23463	50875
1970	13	-	3	18721	20566	39303	4	-	353	2046	2614	5017	17	-	356	20767	23180	44320
1971	37	-	197	2735	33824	36793	7	-	191	1544	1936	3676	44	-	386	4279	35760	40471
1972	36	-	20	6562	27097	33715	4	-	62	1735	2028	3829	40	-	82	8297	29125	37544
1973	70	-	183	14145	41689	56067	1	-	46	9	74	132	71	-	231	14154	41763	56219
1974	30	-	3	28340	30173	58546	3	-	-	967	205	1175	33	-	3	29307	30378	59721
1975	17	-	206	10770	41761	52754	-	-	1	2011	2025	4037	17	-	207	12781	43786	56791
1976	12	-	1311	24051	30219	55593	-	-	-	1995	1128	3123	12	-	1311	26046	31347	58716
1977	26	-	426	7928	53912	62292	3	-	80	703	2915	3701	29	-	506	8631	56827	65993
1978	22	-	94	72033	41462	113611	1	-	-	2470	1061	3532	23	-	94	74503	42523	117143
1979	75	49	1606	45948	30201	77879	-	-	845	2546	2840	6231	75	49	2451	48494	33041	84110
1980	36	36	328	10774	52609	63783	12	-	692	10727	4057	15488	48	36	1020	21501	56666	79271
1981	23	5	13	49755	58323	108119	8	-	1520	5158	5543	12229	31	5	1533	54913	63666	120348
1982	78	5	4281	39510	51970	95844	7	-	1289	4752	1868	7916	85	5	5570	44262	53838	103760
1983	52	10	295	17414	48283	68054	-	-	-	-	-	-	-	-	-	-	-	-
1984	31	-	2462	88588	54153	145234	-	-	-	-	-	-	-	-	-	-	-	-
1985	193	113	1196	3019	55781	60302	12	2	430	1904	9577	11925	205	115	1626	4923	65358	72237
1986	8181	8	958	25425	69725	104297	-	-	-	-	-	-	-	-	-	-	-	-
1987	166	51	2203	1579	44334	48333	-	-	-	-	-	-	-	-	-	-	-	-
1988	108	921	2149	31559	33348	68085	-	-	-	-	-	-	-	-	-	-	-	-
1989	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
1990	52	21	0	0	15993	16066	-	-	-	-	-	-	-	-	-	-	-	-
1991	49	1	0	0	14839	14889	-	-	-	-	-	-	-	-	-	-	-	-
1992	6	9	2085	0	1002	3102	-	-	-	-	-	-	-	-	-	-	-	-
1993	1	4	2	8480	2803	11290	-	-	-	-	-	-	-	-	-	-	-	-
1994	0	0	3424	0	111	3535	253 ^a	168 ^c	733 ^d	8410 ^d	1337 ^c	10901 ^d	7323	7491	8224	13210	14547	25337
1995	0	0	1616	4296	1987	7899	165 ^d	34 ^d	1649 ^d	7818 ^d	10373 ^d	20039 ^d	15963	15997	17646	23848	29925	47977
5-year avg. ^a	22	-	1102	1696	6950	9776	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg. ^b	876	-	1202	7006	23794	32990	-	-	-	-	-	-	-	-	-	-	-	-

^a 1990-1994

^b 1984-1994

^c Subsistence survey not conducted.

^d Harvest estimated from Div. of Subsistence survey.

Appendix Table A4. Commercial and subsistence salmon catches by species, by year in Moses Point Subdistrict, Norton Sound District, 1962-1995.

MOSES POINT (SUBDISTRICT 3)																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1962	27	-	-	11100	50683	61810	-	-	-	-	-	-	27	0	0	11100	50683	61810
1963	15	-	-	2549	46274	48838	5	-	-	5808	8316	14129	20	0	0	8357	54590	62967
1964	32	3	-	3372	28568	31975	-	-	-	63	348	411	32	3	0	3435	28916	32386
1965	-	-	-	-	-	-	16	-	72	1325	9857	11270	16	-	72	1325	9857	11270
1966	17	-	-	2745	24741	27503	14	-	250	2511	5409	8184	31	0	250	5256	30150	35687
1967	-	-	-	-	-	-	39	-	116	1322	9913	11390	39	-	116	1322	9913	11390
1968	12	-	1	9012	17908	26933	2	-	80	6135	2527	8744	14	-	81	15147	20435	35677
1969	29	-	-	11807	26594	38430	9	-	109	1790	1303	3211	38	-	109	13597	27897	41641
1970	39	-	-	13052	29726	42817	16	-	160	4661	6960	11797	55	-	160	17713	36686	54614
1971	95	-	4	922	43831	44852	16	-	271	1046	2227	3560	111	-	275	1968	46058	48412
1972	190	-	11	5866	30919	36986	44	-	108	1579	2070	3801	234	-	119	7445	32989	40787
1973	134	-	-	10603	31389	42126	2	-	-	-	298	300	136	-	0	10603	31687	42426
1974	198	-	9	12821	55276	68304	3	-	-	2382	1723	4108	201	-	9	15203	56999	72412
1975	16	-	-	4407	46699	51122	2	-	6	1280	508	1796	18	-	6	5687	47207	52918
1976	24	-	232	5072	10890	16218	22	-	-	5016	1548	6586	46	-	232	10088	12438	22804
1977	96	-	6	9443	47455	57000	22	-	225	1145	1170	2562	118	-	231	10588	48625	59562
1978	444	-	244	39694	44595	84977	38	-	407	1995	1229	3069	482	-	651	41689	45824	88646
1979	1035	-	177	40811	37123	79146	16	-	890	6078	1195	8179	1051	0	1067	46889	38318	87325
1980	502	-	-	1435	14755	16692	131	-	229	4232	1393	5985	633	0	229	5667	16148	22677
1981	198	-	5	26417	29325	59945	32	-	2345	6530	2819	11726	230	0	2350	32947	32144	67671
1982	253	-	318	9849	40030	50450	1	-	1835	3785	3537	9158	254	0	2153	13634	43567	59608
1983	254	-	-	17027	65776	83057	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	5959	28035	9477	43471	-	-	-	-	-	-	-	-	-	-	-	-
1985	816	32	1803	559	24466	27676	67	-	1389	1212	947	3615	883	32	3192	1771	25413	31291
1986	600	41	5874	15795	20668	42978	-	-	-	-	-	-	-	-	-	-	-	-
1987	907	15	64	568	17278	18832	-	-	-	-	-	-	-	-	-	-	-	-
1988	663	93	3974	13703	18585	37018	-	-	-	-	-	-	-	-	-	-	-	-
1989	62	-	-	-	167	229	-	-	-	-	-	-	-	-	-	-	-	-
1990	202	-	-	501	3723	4426	-	-	-	-	-	-	-	-	-	-	-	-
1991	161	0	0	0	804	965	312	-	2153	3555	2660	8680 ^a	473	-	2153	3555	3464	9645
1992	0	0	3531	0	6	3537	100	-	1281	6152	1260	8793 ^a	100	-	4812	6152	1266	12330
1993	3	0	4065	0	167	4235	368	-	1217	1726	1635	4946 ^a	371	-	5282	1726	1802	9181
1994	0	0	5345	0	414	5759	322 ^a	104 ^a	1180 ^a	9345 ^a	3476 ^a	14427 ^a	322	-	6525	9345	3890	20186
1995	4	44	3742	2962	1171	7923	284 ^a	17 ^a	1353 ^a	2046 ^a	3774 ^a	7474 ^a	288	61	5095	5008	4945	15397
5-year avg. ^a	73	0	2588	100	1023	3784	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg. ^b	341	18	2466	3113	8628	14566	-	-	-	-	-	-	-	-	-	-	-	-

^a 1990-1994^b 1985-1994^c Subsistence survey not conducted.^d Harvest estimated from Div. of Subsistence survey.

NORTON BAY (SUBDISTRICT 4)																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1962	387	7	40	4402	24380	29216	-	-	-	-	-	-	387	7	40	4402	24380	29216
1963	137	2	-	17676	12469	30284	-	-	-	5097	-	5097	137	2	-	22773	12469	35381
1964	50	3	-	988	5916	6957	-	-	-	-	-	-	50	3	-	988	5916	6957
1965	-	-	-	-	-	-	4	-	22	252	3032	3310	4	-	22	252	3032	3310
1966	-	-	-	-	-	-	7	-	41	929	3612	4589	7	-	41	929	3612	4589
1967	-	-	-	-	-	-	12	-	14	1097	2945	4068	12	-	14	1097	2945	4068
1968	-	-	-	-	-	-	28	-	71	1916	1872	3887	28	-	71	1916	1872	3887
1969	26	-	-	4849	3974	8849	59	-	189	2115	3855	6216	85	-	189	6964	7829	15067
1970	-	-	-	-	-	-	3	-	10	840	3500	4353	3	-	10	840	3500	4353
1971	-	-	-	-	-	-	5	-	47	92	2619	2763	5	-	47	92	2619	2763
1972	43	-	-	1713	7799	9555	30	-	44	2089	2022	4185	73	-	44	3802	9821	13740
1973	28	-	-	1645	4672	6345	1	-	-	10	130	141	29	-	-	1655	4802	6486
1974	21	-	-	654	3826	4501	-	-	-	17	900	917	21	-	-	671	4726	5418
1975	68	-	89	1137	17385	18679	1	-	-	93	361	455	69	-	89	1230	17746	19134
1976	102	-	95	4456	7161	11814	2	-	-	41	236	279	104	-	95	4497	7397	12093
1977	158	-	1	2495	13563	16217	14	-	-	420	2055	2489	172	-	1	2915	15618	18706
1978	470	-	144	8471	21973	31058	12	-	21	1210	1060	2303	482	-	165	9681	23033	33361
1979	856	-	2547	6201	15599	25203	12	-	697	735	1400	2844	868	-	3244	6936	16999	28047
1980	340	-	-	47	7855	8242	22	-	33	4275	1132	5462	362	-	33	4322	8987	13704
1981	63	-	-	177	3111	3351	7	-	82	2314	3515	5918	70	-	82	2491	6626	9269
1982	96	-	2332	2535	7128	12091	1	-	484	2600	2485	5570	97	-	2816	5135	9613	17661
1983	215	-	204	3935	17157	21511	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	1162	3442	4604	-	-	-	-	-	-	-	-	-	-	-	-
1985	528	-	384	68	9948	10928	-	-	-	-	-	-	-	-	-	-	-	-
1986	139	2	1512	40	1994	3687	-	-	-	-	-	-	-	-	-	-	-	-
1987	544	-	145	16	3586	4291	-	-	-	-	-	-	-	-	-	-	-	-
1988	434	2	709	1749	7521	10415	-	-	-	-	-	-	-	-	-	-	-	-
1989	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
1990 ^d	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
1991 ^d	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
1992	27	0	0	0	1787	1814	-	-	-	-	-	-	-	-	-	-	-	-
1993	267	0	0	290	1378	1935	-	-	-	-	-	-	-	-	-	-	-	-
1994	0	0	0	0	0	0	308	1	370	6049	4581	11309 ^e	308	1	370	6049	4581	11309
1995	0	0	0	0	0	0	475	46	985	3514	5828	10848 ^e	475	46	985	3514	5828	10848
5-year avg ^a	59	0	0	58	633	750	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg ^b	194	0	275	216	2621	3307	-	-	-	-	-	-	-	-	-	-	-	-

^a 1990-1994

^b 1985-1994

^c Subsistence survey not conducted.

^d No commercial harvest reported.

^e Harvest estimated from Div. of Subsistence survey.

Appendix Table A5. Commercial and subsistence salmon catches by species, by year in Shaktoolik Subdistrict, Norton Sound District, 1961-1995.

SHAKTOOLIK (SUBDISTRICT 5)																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1961	140	-	-	29075	24746	53961	-	-	-	-	-	-	140	-	-	29075	24746	53961
1962	1738	-	2113	640	8718	13209	-	-	-	-	-	-	1738	-	2113	640	8718	13209
1963	480	11	563	5138	19153	25345	-	-	-	-	-	-	480	11	563	5138	19153	25345
1964	631	79	16	1969	35272	37967	77	-	340	2132	5412	7961	708	79	356	4101	40684	45928
1965	127	30	-	3	8356	8516	31	-	107	3763	3420	7321	158	30	107	3766	11776	15837
1966	310	-	956	344	8292	9902	142	-	762	1445	4183	6532	452	-	1718	1789	12475	16434
1967	43	-	88	1050	1655	2836	262	-	387	2010	4438	7095	305	-	475	3060	6091	9931
1968	61	-	130	2205	2504	4900	10	-	458	6355	1915	8738	71	-	588	8560	4419	13638
1969	33	-	276	6197	8645	15151	40	-	193	4018	3439	7690	73	-	469	10215	12084	22841
1970	197	-	155	2301	15753	18406	43	-	210	2474	2016	4743	240	-	365	4775	17769	23149
1971	284	-	238	28	13399	13949	87	-	329	494	5060	5970	371	-	567	522	18459	19919
1972	419	-	11	2798	12022	15250	64	-	235	939	3399	4637	483	-	246	3737	15421	19887
1973	289	-	177	6450	14500	21416	51	-	130	3410	1397	4988	340	-	307	9860	15897	26404
1974	583	-	179	5650	26391	32803	93	-	353	1901	358	2705	676	-	532	7551	26749	35508
1975	651	2	812	1774	49536	52775	18	-	14	1394	334	1760	669	2	826	3168	49870	54535
1976	892	-	129	15803	15798	32622	24	-	121	1188	269	1602	916	-	250	16991	16067	34224
1977	1521	4	418	7743	36591	46277	49	-	170	585	2190	2994	1570	4	588	8328	38781	49271
1978	1339	7	1116	46236	35388	84086	81	-	15	3275	1170	4541	1420	7	1131	49511	36558	88627
1979	2377	-	3383	18944	22030	46734	62	-	1605	2575	1670	5912	2439	-	4988	21519	23700	52646
1980	1086	-	8001	1947	27453	38487	57	-	756	3227	1827	5867	1143	-	8757	5174	29280	44354
1981	1484	4	1191	29695	21097	53471	8	-	525	2225	3490	6248	1492	4	1716	31920	24587	59719
1982	1677	3	22233	17019	26240	67172	68	-	2138	3865	1165	7236	1745	3	24371	20884	27405	74408
1983	2742	4	12877	12031	67310	94954	-	-	-	-	-	-	-	-	-	-	-	-
1984	1613	-	10730	1596	32309	46248	-	-	-	-	-	-	-	-	-	-	-	-
1985	5312	-	2808	-	13403	21523	298	-	1379	24	298	1999	5610	-	4187	24	13701	23522
1986	1075	29	6626	-	16126	23856	-	-	-	-	-	-	-	-	-	-	-	-
1987	2214	-	6193	-	14088	22495	-	-	-	-	-	-	-	-	-	-	-	-
1988	671	79	6096	3681	21521	32048	-	-	-	-	-	-	-	-	-	-	-	-
1989	1241	43	8066	-	19641	28991	-	-	-	-	-	-	-	-	-	-	-	-
1990	2644	49	4695	-	21748	29136	-	-	-	-	-	-	-	-	-	-	-	-
1991	1324	55	11614	-	31619	44612	-	-	-	-	-	-	-	-	-	-	-	-
1992	1098	56	14680	-	27867	43681	-	-	-	-	-	-	-	-	-	-	-	-
1993	2756	20	11130	106743	20864	141513	-	-	-	-	-	-	-	-	-	-	-	-
1994	885	8	22065	502231	5411	530600	1175 ^a	1 ^d	2777 ^d	9133 ^d	1221 ^d	14307 ^d	2060	9	24842	511364	6632	544907
1995	1239	5	10856	37377	14775	64252	1275 ^a	2480 ^d	2626 ^d	7024 ^d	2480 ^d	15885 ^d	2514	2485	13482	44401	17255	80137
5-year avg. ^a	1741	38	12833	121795	21502	157908	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg. ^a	1922	34	9395	61266	19229	91846	-	-	-	-	-	-	-	-	-	-	-	-

^a 1990-1994^b 1985-1994^c Subsistence survey not conducted.^d Harvest estimated from Div. of Subsistence survey.

UNALAKLEET (SUBDISTRICT 6)

Year	Commercial						Subsistence						Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1961	5160	35	13807	5162	23586	47750	-	-	-	-	-	-	5160	35	13807	5162	23586	47750
1962	5089	-	6739	6769	30283	48880	-	-	-	-	-	-	5089	-	6739	6769	30283	48880
1963	5941	18	16202	1140	27003	50304	-	-	-	-	-	-	5941	18	16202	1140	27003	50304
1964	1273	1	79	1	19611	20965	488	-	2227	7030	6726	16471	1761	1	2306	7031	26337	37436
1965	1321	-	2030	24	26498	29873	521	-	4562	11488	6791	25362	1842	-	6592	11512	35289	55235
1966	1208	-	4183	5023	16840	27254	90	-	788	8083	3387	10349	1298	-	4972	11106	20227	37603
1967	1751	-	1544	21961	8502	33758	490	-	484	9964	-	10938	2241	-	2028	31925	8502	44696
1968	960	-	6549	41474	14865	63848	186	-	1493	11044	2982	15705	1146	-	8042	52518	17847	79553
1969	2276	-	5273	40558	22032	70139	324	-	1483	4230	4196	10233	2600	-	6756	44788	26228	80372
1970	1604	-	4261	30779	40029	76673	495	-	3907	10104	7214	21720	2099	-	8168	40883	47243	98393
1971	2166	-	2688	1196	37543	43593	911	-	3137	2230	7073	13351	3077	-	5825	3426	44616	56944
1972	2235	-	412	28231	20440	51318	643	-	1818	3132	4132	9725	2878	-	2230	31363	24572	61043
1973	1397	-	8922	13335	25716	49370	323	-	213	6233	3426	10195	1720	-	9135	19569	29142	59565
1974	2100	-	1778	93332	36170	133380	313	-	706	7341	588	8948	2413	-	2484	100673	36758	142328
1975	1638	-	3167	12137	48740	65682	163	-	74	4758	2038	7033	1801	-	3241	16895	50778	72715
1976	1211	1	5141	37203	24268	67824	142	-	694	4316	2832	7984	1353	1	5835	41519	27100	75808
1977	2691	1	2781	21001	32936	59410	723	-	1557	8870	6085	17235	3414	1	4338	29871	39021	76645
1978	7525	5	5737	136200	37079	186546	1044	-	2538	13268	3442	20292	8569	5	8275	149468	40521	206838
1979	6354	8	23696	49647	30445	110150	640	-	3330	6960	1597	12527	6994	8	27026	56607	32042	122677
1980	4339	3	21512	203142	64198	293194	1046	-	4758	19071	5230	30105	5385	3	26770	222213	69428	323299
1981	6157	47	29845	123233	39186	198468	869	24	5808	5750	4235	16686	7026	71	35653	128983	43421	215154
1982	3768	2	61343	142856	44520	252489	913	2	7037	20045	4694	32691	4681	4	68380	162901	49214	285180
1983	7022	13	36098	26198	109220	176551	1868	33	6888	13808	4401	26998	8890	46	42986	40006	113621	205549
1984	6804	6	47904	-	43317	98031	1650	1	6675	17418	3348	29092	8454	7	54579	17418	46665	127123
1985	12621	21	15421	1	25111	53175	1397	3	2244	55	1968	5667	14018	24	17665	56	27079	58842
1986	4494	153	20580	-	30239	55466	-	-	-	-	-	-	-	-	-	-	-	-
1987	3246	141	15097	97	17525	36106	-	-	-	-	-	-	-	-	-	-	-	-
1988	2218	157	24232	23730	25363	75700	-	-	-	-	-	-	-	-	-	-	-	-
1989	4402	222	36025	-	20825	61474	-	-	4681	17500	1388	-	-	-	-	-	-	-
1990	5998	358	52015	-	23659	82030	2476	-	-	-	-	-	-	-	-	-	-	-
1991	4534	147	52033	-	39609	96323	-	-	-	-	-	-	-	-	-	-	-	-
1992	3409	229	84449	6284	52547	146918	-	-	-	-	-	-	-	-	-	-	-	-
1993	5944	251	26290	42061	28156	102702	-	-	-	-	-	-	-	-	-	-	-	-
1994	4400	71	71019	480158	12288	567936	5294	819	16081	31572	12732	66498	9694	890	87100	511730	25020	634434
1995	7617	78	31280	37009	24843	100827	5049	807	13110	17246	13460	49672	12686	885	44390	54255	38303	150499
5-year avg. ^a	4857	211	57161	105701	31252	199182	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg. ^b	5127	175	39716	55233	27532	127783	-	-	-	-	-	-	-	-	-	-	-	-

^a 1990-1994

^b 1985-1994

^c Subsistence catches from 1966-72 includes fish taken at St. Michael.

^d Subsistence surveys not conducted.

^e In-depth survey by Subsistence Division.

^f Harvest estimate from Div. of Subsistence survey, includes harvest in Stebbins and St. Michael.

Appendix Table A8. Commercial and subsistence salmon catches by species, by year for all subdistricts in Norton Sound District, 1961-1995.

ALL SUBDISTRICTS																		
Commercial							Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1961	5300	35	13807	34327	48332	101801	-	-	-	-	-	-	5300	35	13807	34327	48332	101801
1962	7286	18	9156	33167	182784	232431	-	-	-	-	-	-	7286	18	9156	33167	182784	232431
1963	6613	71	16765	55625	154789	233863	5	-	118	16607	17635	34365	6618	71	16883	72232	172424	268228
1964	2018	126	98	13567	148862	164871	565	-	2567	9225	12486	24843	2583	126	2665	22762	161348	189514
1965	1449	30	2030	220	36795	40524	574	-	4812	19131	30772	55289	2023	30	6842	19351	67567	95613
1966	1553	14	5755	12778	80245	100345	269	-	2210	14335	21873	38687	1822	14	7965	27113	102118	139032
1967	1804	-	2379	28879	41756	74818	617	-	1222	17518	22724	42279	2621	-	3601	48395	84480	117097
1968	1045	-	6885	71179	45300	124409	237	-	2391	36912	11661	51201	1282	-	9276	108091	58661	175610
1969	2392	-	6836	86949	82795	178972	436	-	2191	18562	15615	36804	2626	-	9027	105511	86410	215776
1970	1853	-	4423	84908	107034	178218	561	-	4675	26127	22763	54126	2414	-	9088	91035	129797	232344
1971	2593	-	3127	4865	131362	141977	1026	197	4097	10863	21618	37801	3619	197	7224	15758	152980	179778
1972	2938	-	454	45182	100920	149494	804	93	2319	14158	13673	31247	3742	-	2773	59340	114793	180741
1973	1918	-	8282	46499	119098	176797	382	-	520	14770	7185	22667	2310	-	6802	61289	126263	199684
1974	2951	-	2092	148519	162267	315829	420	-	1064	18426	3958	21888	3371	-	3156	164945	166225	337697
1975	2393	2	4593	32388	212485	251681	188	11	192	15803	8113	24305	2579	13	4785	48191	220598	276186
1976	2243	11	6934	87919	95656	193063	203	-	1004	16048	7718	26973	2446	11	7938	105967	103674	220036
1977	4500	5	3690	48675	200455	257325	846	-	2530	14296	26607	44279	5346	5	8220	82971	227062	301804
1978	9819	12	7335	325503	189279	531948	1211	-	2981	35281	12257	51730	11030	12	10316	380784	201536	583678
1979	10706	57	31436	167411	140789	350401	747	-	8487	25247	11975	46456	11453	57	39925	192658	152784	396857
1980	6311	40	29842	227352	180792	444337	1397	-	8825	63778	19622	93422	7708	40	38487	291130	200414	537759
1981	7929	56	31562	232479	169708	441734	2021	38	13416	28741	32866	77082	9950	64	44978	261220	202574	518816
1982	5892	10	91690	230281	183335	511208	1011	6	14612	54249	18580	86480	6903	18	106302	284530	201915	599668
1983	10308	27	49735	78813	318437	458420	-	-	-	-	-	-	-	-	-	-	-	-
1984	8455	6	67675	119381	148442	342159	-	-	-	-	-	-	-	-	-	-	-	-
1985	19491	168	21968	3647	134928	180200	-	-	-	-	-	-	-	-	-	-	-	-
1986	6395	233	35600	41290	146912	230400	-	-	-	-	-	-	-	-	-	-	-	-
1987	7080	207	24279	2260	102457	136283	-	-	-	-	-	-	-	-	-	-	-	-
1988	4096	1252	37214	74804	107968	225132	-	-	-	-	-	-	-	-	-	-	-	-
1989	5707	265	44091	123	42625	92811	-	-	-	-	-	-	-	-	-	-	-	-
1990	8865	434	56712	501	85123	131685	-	-	-	-	-	-	-	-	-	-	-	-
1991	6068	203	83647	-	86871	156789	-	-	-	-	-	-	-	-	-	-	-	-
1992	4541	296	105418	6284	83394	199933	-	-	-	-	-	-	-	-	-	-	-	-
1993	8972	279	43283	157574	53562	263670	-	-	-	-	-	-	-	-	-	-	-	-
1994	5285	80	102140	882389	18290	1108184	7374 *	1161 *	22124 *	71068 *	25020 *	126745 *	12659	1241	124284	1053455	43310	1234929
1995	6860	128	47862	81644	42698	181392	7766 *	1222 *	23015 *	36594 *	43014 *	113611 *	16626	1350	70877	120236	65912	295003
5-year avg. *	6752	256	74240	229350	61448	372048	-	-	-	-	-	-	-	-	-	-	-	-
10-year avg. *	7653	342	53435	126864	84213	272507	-	-	-	-	-	-	-	-	-	-	-	-

* 1960-1994

* 1985-1994

* These figures also include data from Stebbins and St. Michael.

* Subsistence surveys not conducted.

* Harvest estimate from Div. of Subsistence survey.

Appendix Table A9. Mean salmon weights, Norton Sound District, 1962-1995.

Year	Mean Round Weight in Pounds ^a			
	Chinook	Coho	Pink	Chum
1962	-	-	-	-
1963	-	-	-	-
1964	-	-	-	7.0
1965	-	-	2.3	7.1
1966	-	-	3.5	7.8
1967	23.7	7.0	3.6	7.2
1968	20.0	7.0	4.0	7.5
1969	19.3	7.5	3.6	6.4
1970	20.0	7.0	3.5	7.8
1971	23.7	7.0	3.6	7.2
1972	20.0	7.3	2.8	6.9
1973	20.3	6.8	3.9	7.1
1974	18.2	6.7	3.4	6.6
1975	10.8	7.4	2.9	6.5
1976	15.2	7.2	3.1	7.0
1977	22.7	7.6	3.3	7.0
1978	22.8	6.9	3.6	7.4
1979	22.9	7.1	3.6	7.2
1980	21.5	6.8	3.2	7.2
1981	20.7	6.7	3.5	7.6
1982	16.5	7.1	2.9	7.3
1983	17.4	7.2	3.6	7.4
1984	20.0	7.7	2.9	7.0
1985	21.5	7.7	3.1	7.0
1986	20.8	6.9	3.2	6.9
1987	20.0	7.3	3.0	7.1
1988	16.4	7.5	3.0	7.1
1989	18.4	7.6	3.6	7.0
1990	19.0	7.5	-	7.4
1991	17.7	7.4	-	6.9
1992 ^b	12.7	7.8	2.9	7.1
1993	16.9	6.6	2.6	6.5
1993	18.6	7.5	2.2	6.7
1995	19.7	7.4	2.4	6.7

^a Based on age-weight-length samples or fish tickets.

^b Low chinook weight due to restricted mesh size.

Appendix Table A10. Estimated mean prices paid to commercial salmon fishermen, Norton Sound District, 1962 - 1995.

Year	Chinook	Coho	Pink	Chum
Price Per Fish				
1962	\$3.85	\$0.60	\$0.25	\$0.35
1963	\$3.85	\$0.60	\$0.25	\$0.35
1964	\$4.50	-	\$0.25	\$0.40
1965	\$3.75	\$0.45	-	\$0.40
1966	\$4.80	\$1.05	\$0.25	\$0.65
Price Per Pound				
1967	\$0.20	\$0.14	\$0.07	\$0.09
1968	\$0.25	\$0.14	\$0.06	\$0.10
1969	\$0.22	\$0.14	\$0.06	\$0.11
1970	\$0.25	\$0.14	\$0.06	\$0.10
1971	\$0.25	\$0.14	\$0.07	\$0.10
1972	\$0.27	\$0.16	\$0.06	\$0.11
1973	\$0.40	\$0.16	\$0.07	\$0.32
1974	\$0.40	\$0.16	\$0.13	\$0.32
1975	\$0.40	\$0.16	\$0.13	\$0.24
1976	\$0.50	\$0.32	\$0.17	\$0.30
1977	\$0.65	\$0.40	\$0.16	\$0.30
1978	\$0.65	\$0.35	\$0.20	\$0.30
1979	\$0.88	\$0.66	\$0.16	\$0.41
1980	\$0.74	\$0.63	\$0.07	\$0.23
1981	\$1.25	\$0.62	\$0.13	\$0.26
1982	\$1.25	\$0.57	\$0.12	\$0.32
1983	\$1.13	\$0.39	\$0.11	\$0.28
1984	\$1.20	\$0.45	\$0.11	\$0.24
1985	\$1.08	\$0.48	\$0.20	\$0.31
1986	\$0.88	\$0.52	\$0.15	\$0.27
1987	\$1.11	\$0.57	\$0.20	\$0.33
1988	\$1.26	\$1.13	\$0.19	\$0.39
1989	\$0.73	\$0.43	\$0.10	\$0.18
1990	\$1.01	\$0.50	\$0.75 ^a	\$0.23
1991	^b \$0.87	\$0.36	-	\$0.27
1992	^c \$0.66	\$0.33	\$0.16	\$0.22
1993	^d \$0.72	\$0.22	\$0.15	\$0.24
1994	\$1.02	\$0.52	\$0.15	\$0.29
1995	\$0.66	\$0.43	\$0.18	\$0.18

^a Price paid per pound of roe.

^b Price paid for coho and chum roe was \$3.00 per pound.

^c Price paid for coho roe was \$1.50 per pound.

^d Price paid for coho roe was \$1.76 per pound and \$0.40 per pound for sockeye.

Appendix Table A11.

Dollar estimates of Norton Sound District
commercial salmon fishery, 1961 - 1995.

Year	Gross Value of Catch to Fishermen	Wages Earned ^b	License and Tax Revenues to State (License Fees Only)
1961	^a	^a	\$2,010.00
1962	\$105,800.00	^a	\$16,341.00
1963	\$104,000.00	^a	\$18,009.00
1964	\$51,000.00	^a	\$11,305.00
1965	\$21,483.00	^a	\$5,084.00
1966	\$68,000.00	^a	\$4,680.00
1967	\$44,038.00	\$58,000.00	\$3,500.00
1968	\$63,700.00	^a	\$4,000.00
1969	\$95,297.00	\$72,145.00	^a
1970	\$99,019.00	\$55,100.00	\$5,595.00
1971	\$101,000.00	\$65,500.00	\$5,730.00
1972	\$102,225.00	\$68,700.00	\$7,000.00
1973	\$308,740.00	\$81,000.00	\$15,400.00
1974	\$437,127.00	\$129,600.00	\$20,028.00
1975	\$413,255.00	\$172,800.00	\$28,230.00
1976	\$285,283.00	^a	\$10,133.00
1977	\$528,610.00	^a	\$11,386.00
1978	\$814,221.00	^a	\$12,002.00
1979	\$876,547.00	^a	\$11,780.00
1980	\$583,388.00	^a	\$11,640.00 ^c
1981	\$758,471.00	^a	\$11,940.00
1982	\$988,588.00	^a	\$7,155.00 ^{c,d}
1983	\$1,038,967.00	^a	\$10,700.00 ^c
1984	\$721,055.00	^a	\$9,690.00 ^c
1985	\$822,056.00	^a	\$5,820.00 ^e
1986	\$539,576.00	^a	\$5,970.00 ^e
1987	\$504,631.00	^a	\$5,940.00 ^e
1988	\$754,751.00	^a	\$10,050.00 ^{e,f}
1989	\$274,817.00	^a	\$10,300.00 ^e
1990	\$497,623.00	^a	\$10,350.00 ^e
1991	\$425,430.00	^a	\$10,250.00 ^e
1992	\$448,395.00	^a	\$10,200.00 ^e
1993	\$322,117.00	^a	\$8,835.00 ^e
1994	\$864,882.00	^a	\$10,000.00 ^e
1995	\$356,912.00	^a	\$5,250.00 ^e

^a Information not available.^b Includes wages paid to tender boat operators, processing plant employees in district.^c Includes only permit renewals and vessel license fees.^d The Alaska state legislature lowered all resident permit renewal fees and vessel license fees to poverty level fees for 1982.^e Includes only permit renewal fees.^f The Alaska state legislature raised resident permit renewal fee to \$50.00 in 1988.

Appendix Table A12.

Round weight of commercially caught salmon by
species, Norton Sound District, 1961 - 1995.

Year	Pounds Caught (Round Wt. in Lbs)				Salmon Roe (lbs)
	Chinook	Coho	Pink	Chum	
1961	120,405	96,649	102,711	347,990	
1962 ^a	157,000	-	10,569	221,645	
1963 ^a	89,700	51,750	-	-	
1964 ^a	39,169	686	-	249,890	
1965	33,327	14,210	660	264,924	^b
1966	35,259	40,285	38,334	577,764	16,901
1967	41,854	15,944	100,913	289,473	21,429
1968 ^c	22,954	50,665	250,044	306,871	20,381
1969 ^d	51,441	50,461	312,836	529,235	5,578
1970	38,103	25,000	156,313	610,588	1,345
1971	43,112	22,078	15,377	857,014	1,122
1972	57,675	3,257	133,389	710,853	1,083
1973	38,935	63,812	185,799	845,596	^b
1974	54,433	15,023	511,737	1,082,575	39,876
1975	25,964	32,345	87,586	1,318,111	46,470
1976	34,095	49,822	271,867	669,728	^b
1977	102,341	28,044	162,457	1,415,981	^b
1978	222,974	50,872	1,164,174	1,389,806	^b
1979	231,988	251,129	598,785	1,001,548	^b
1980	135,646	204,498	719,368	1,301,693	^b
1981	164,182	212,065	719,102	1,284,193	^b
1982	97,255	648,212	659,171	1,338,788	95
1983	179,666	360,264	274,568	2,352,104	239
1984	169,104	523,310	343,685	1,020,635	0
1985	419,331	169,413	11,458	939,885	0
1986	133,161	247,333	133,319	1,011,824	0
1987	141,494	177,569	6,691	731,597	0
1988	67,148	280,658	226,966	767,168	0
1989	104,829	336,652	439	297,156	0
1990	168,745	426,902	-	482,060	75
1991	107,541	469,495	-	597,272	221
1992	57,571	820,406	18,230	595,345	2,641
1993	151,504	287,702	406,820	347,072	2,608
1994	98,492	102,140	2,185,066	122,540	0
1995	174,771	356,190	198,121	290,445	0

^a Does not include canned salmon cases (48#)

1962: 29 chinook, 883 coho, 927 pink, 12459 chum

1963: 604 chinook, 808 coho, 1,918 pink, 13,308 chum

1964: 75 chinook, 452 pink, 9,357 chum

^b Information not available.

^c Includes about 48,000 lbs of salted coho, about 150,000 lbs. of salted pink, and 150,000 lbs of salted chum.

^d Includes about 598 lbs. of salted chinook, about 48,092 lbs. of salted pink and about 117,664 lbs. salted chum.

Appendix Table A13. Comparative salmon escapement indices of Norton Sound streams, 1961-1995^a.

Year	Chinook	Chum	Pink	Pink & Chum Dub	Coho
Siuuk River					
1975	-	4,662	5,390	-	-
1977	-	5,207	1,302	-	-
1978	-	8,756	22,435	-	-
1980	3	2,022	199,000	-	1,002
1981	-	5,579	350	-	-
1982	-	638	148,800	-	-
1983	48	2,150	10,770	-	96
1984	7 ^h	493 ^h	284,400 ^h	-	192
1985	4	1,910	8,860	-	33
1986	4	1,960	28,690	-	-
1987	5	4,540	30	-	230
1988	3	2,070	4,652 ⁱ	-	563
1989	-	1,025	26,850	-	75
1990	-	95	29,040	-	161
1991	3	5,420	14,680	-	701
1992	-	470	292,400	-	422
1993	7	1,570	5,120	-	104
1994	10	1,140	492,000	-	307
1995	-	3,110	1,250	-	290
Nome River					
1971	-	75	7,765	-	-
1972	-	710	14,960	-	-
1973	6	1,760	14,940	-	-
1974	-	854	17,832	-	-
1975	1	2,161	3,405	-	-
1977	5	3,046	1,726	-	-
1978	2	5,242	34,900	-	-
1980	5	-	-	179,095	920
1981	15	1,195	12,565	-	-
1982	-	700	327,570	-	-
1983	2	198	9,170	-	365
1984	-	2,084 ^h	178,870	-	839
1985	7	1,967	2,250	-	242
1986	2	1,150	13,580	-	-
1987	3	1,646	1,400 ^h	-	419
1988	3	973	2,490 ⁱ	-	1,280 ^h
1989	2	72	1,365	-	375
1990	-	541	13,085	-	617
1991	9	3,520	4,690	-	611
1992	3	813	255,700	-	691
1993	8	1,520	8,941	-	276 ^d
1994	2	350	265,450	-	631 ^d
1995	-	1,855	182	-	517
Flambeau River					
1976	-	375	1,994	-	-
1977	-	1,275	10	-	-
1978	-	7,110	-	-	-
1979	-	283	291	-	-
1980	-	-	-	29,190	-
1981	1	12,031	2,710	-	-
1982	1	5,097	25,001	-	-
1983	2	1,195	200	-	-
1984	1	3,150 ^g	20,200 ^g	-	-
1985	1	3,215	260	-	-
1986	2	3,075	300	-	-
1987	0	115	0	-	-
1988	3	765	10	-	-
1989	-	-	-	-	-
1990	-	-	-	-	-
1991	2	1,564	570	-	-
1992	-	606	180	-	-
1993	-	1,590	-	-	-
1994	1	4,960	290	-	-
1995	-	6,455	350	-	68

-Continued-

Appendix Table A13. (page 2 of 5)

Year	Chinook	Chum	Pink	Pink & Chum ^b	Coho
Eldorado River					
1974	13	2,143	6,185	-	-
1977	-	1,835	125	-	-
1978	-	10,125	12,800	-	-
1980	8	9,900	55,520	-	-
1981	-	15,605	495	-	-
1982	2	1,095	163,300	-	-
1983	11	994	270	-	100
1984	14	4,381 ⁹¹	1,924,935 ⁹¹	-	261
1985	8	6,090	150	-	87
1986	9	3,490	18,200	-	-
1987	6	3,860	0	-	108
1988	17	2,645	1,045	-	78
1989	-	350	1,550	-	87
1990	17	884	2,050	-	44
1991	78	5,755	1,590	-	88
1992	-	4,887	6,615	-	113
1993	38	2,885	120	-	110
1994	2	5,140	53,880	-	242
1995	-	9,025	50	-	247
Fish River					
1961	1	-	-	14,100	-
1962	48	-	-	28,918	-
1963	21	-	-	25,728	-
1964	-	18,870	10,935	14,550	-
1966	7	-	-	17,955	-
1967	20	-	-	13,810	-
1968	10	-	-	164,000	-
1969	-	2,080	124,000	-	-
1970	33	78,550	198,000	-	-
1971	1	13,185	1,870	-	-
1972 ^d	-	3,616	13,050	-	-
1973	31	6,887	15,564	-	-
1974	7	10,945	15,890	-	-
1975	28	20,114	15,840	-	-
1976	1	8,390	15,850	8,550	-
1977	9	9,664	2,430	-	-
1978	29	26,797	140,640	-	-
1979	11	6,893	9,132	-	-
1980	-	19,100	33,500	-	-
1981	90	24,095	450	-	-
1982	-	-	-	241,700	-
1983	67	20,037	300	-	-
1984	42	-	-	293,245	-
1985	303	21,080	7,385	-	-
1986	200	25,190	140	-	-
1987	193	7,888	0	-	-
1988	38	1,240	29,950	-	-
1989	-	-	-	-	-
1990	-	-	-	-	-
1991	58	10,190	51,190	-	-
1992	4	390	1,387,000	-	-
1993	48	12,695	13,440	-	-
1994	55	18,500	910,000	-	-
1995	40	13,433	780	-	1,829
Kachawik Creek					
1963	-	16,000	16,000	-	-
1964	-	5,284	3,675	-	-
1966	-	756	1,788	-	-
1967 ^e	-	-	-	1,780	-
1969	-	800	4,525	-	-
1970	-	500	-	-	-
1971	-	1,000	5,323	-	-
1972	-	3,100	18,950	-	-
1973	-	10,325	22,275	-	-
1974	-	1,845	2,723	-	-
1975	-	1,735	23,380	-	-
1977 ^d	-	9,584	30,432	-	-
1978 ^d	-	3,481	26,533	-	-
1979	-	2,650	23,850	-	-
1982	-	1,111	72,235	-	-
1988	-	1,440	3,130	-	-

-Continued-

Appendix Table A13. (page 3 of 5)

Year	Chinook	Chum	Pink	Pink & Chum ^b	Coho
Boston Creek					
1963	67	1,669	-	-	-
1964	10	3,315	-	-	-
1966 ^c	153	761	-	-	-
1968	7	2,500	2,500	-	-
1969	100	7,000	16,000	-	-
1970	246	8,200	12,900	-	-
1971	42	7,045	80	-	-
1972	57	4,252	3,950	-	-
1973	153	3,014	3,213	-	-
1974	231	2,426	749	-	-
1975	147	1,885	2,556	-	-
1977	76	1,325	385	-	-
1978	136	2,655	74,221	-	-
1979	58	882	271	-	-
1980	16	2,450	1,510	-	-
1982	10	1,730	22,020	-	-
1983	154	704	-	-	-
1984	35	-	-	47,850	-
1985	243	3,450	-	-	-
1986	2	220	0	-	-
1987	583	3,640	0	-	-
1988	163	1,040	7,400 ^l	-	-
1989	-	-	-	-	-
1990	-	1,455	8,440	-	-
1991	152	2,550	3,210	-	-
1992	68	1,540	803,200	-	-
1993	227	4,513	1,930	-	-
1994	95	4,270	355,600	-	-
1995	78	4,221	-	-	230
Niukluk River					
1962	11	-	-	27,879	-
1963	1	13,667	4,103	-	-
1964	-	8,395	10,495	-	-
1966	-	21,300	8,600	4,700	-
1967	-	20,546	-	-	-
1968	-	-	-	87,085	-
1969	-	10,240	92,650	-	-
1970	-	7,300	60,350	-	-
1971	-	22,605	8,370	-	-
1972 ^c	-	10,500	22,600	-	-
1973	-	14,365	14,790	-	-
1974	1	8,720	8,915	-	-
1975	-	10,089	16,258	-	-
1976	-	4,130	7,190	-	-
1977	19	10,456	4,150	-	-
1978	2	14,365	208,300	-	-
1979 ^d	8	10,127	30,147	-	-
1980	-	8,915	75,770	-	-
1981	-	7,249	-	-	-
1982	20	2,557	227,540	-	-
1983	54	8,886	50	-	-
1984 ^l	6	-	-	57,208	3,072
1985	25	11,140	-	-	332 ^k
1986	2	2,442	0	-	-
1987	10	4,145	0	-	257 ^k
1988	18	6,501	8,160 ^j	-	1,095 ^k
1989	-	-	-	-	182
1990	-	6,200	-	-	170
1991	24	10,660	37,410	-	1,783
1992	-	7,770	803,200	-	812
1993	15	19,910	2,840	-	2,104
1994	7	16,470	1,294,100	-	274
1995	48	25,358	200	-	2,136

-Continued-

Appendix Table 13.

(page 4 of 5)

Year	Chinook	Chum	Pink	Pink & Chum	Coho
Kwiniuk River					
1962	3	-	-	23,249	-
1963	2	11,340	3,779	-	-
1964	-	14,533	-	-	-
1965 ^a	14	26,634	8,301	-	-
1966 ^a	7	32,786	10,629	-	-
1967 ^a	13	24,444	3,508	-	-
1968 ^a	27	18,813	126,764	-	-
1969 ^a	12	19,687	56,683	-	-
1970 ^a	-	68,004	235,131	-	-
1971 ^a	37	39,046	16,742	-	-
1972 ^a	65	30,686	62,461	-	-
1973 ^a	57	28,617	38,420	-	-
1974 ^a	62	35,899	40,816	-	-
1975 ^a	44	14,344	57,317	-	-
1976 ^a	12	6,977	29,471	-	-
1977 ^a	84	22,757	46,234	-	-
1978 ^a	74	14,408	72,270	-	-
1979 ^a	107	12,355	167,462	-	-
1980 ^a	177	19,374	320,389	-	-
1981 ^a	136	34,561	566,417	-	-
1982 ^a	138	44,036	469,674	-	-
1983 ^a	267	56,907	251,965	-	-
1984 ^a	736	54,043	736,544	-	983
1985 ^a	712	9,912	22,548	-	673
1986 ^a	653	24,704	241,446	-	421
1987 ^a	314	16,134	5,567	-	819
1988 ^a	321	13,301	187,904	-	444
1989 ^a	282	13,689	30,275	-	-
1990 ^a	744	13,735	404,452	-	746
1991 ^a	587	18,802	54,591	-	809
1992 ^a	479	12,077	1,464,717	-	532
1993 ^a	565	15,823	43,065	-	1,238
1994 ^a	627	33,010	2,303,112	-	2,841
1995 ^a	468	42,161	17,573	-	1,625
Tubutulik River					
1962	3	-	-	16,690	-
1963	9	16,069	4,355	-	-
1964	-	15,469	10,043	3,420	-
1966	-	5,514	26,000	-	-
1967	1	-	-	22,475	-
1969	3	12,040	12,788	3,045	-
1970	-	53,290	136,590	-	-
1971	-	16,820	7,500	5,065	-
1972 ^c	-	8,070	21,100	-	-
1973	131	5,383	15,665	-	-
1974	136	9,560	17,940	-	-
1975	7	17,141	38,003	-	-
1976	-	1,095	6,095	2,600	-
1977	-	8,540	4,685	-	-
1978	2	5,865	1,364	-	-
1979	-	812	1,624	-	-
1980 ^a	405	21,616	663,837	-	-
1982 ^c	49	2,044	53,605	-	-
1983	135	16,345	40,790	-	-
1984	139	56,210	90,600	-	-
1985	472	13,645	8,040	-	-
1986	453	5,975	35,680	-	-
1987	474	9,605	580	-	-
1988	561	4,660	114,450	-	-
1989 ^c	-	-	-	-	-
1990	397	4,350	186,400	-	-
1991	661	7,085	26,870	-	-
1992	260	2,595	138,600	-	-
1993	1,061	8,740	18,650	-	1,365
1994	No survey due to poor conditions			-	-
1995	377	16,158	4,020	-	930

-Continued-

Appendix Table A13. (page 5 of 5)

Year	Chinook	Chum	Pink	Pink & Chum ^b	Coho
North River					
1962	162	-	-	16,087	-
1963 ^c	287	-	-	73,274	-
1964	23	-	-	5,981	-
1965	153	-	-	16,600	-
1970 ^c	1	20,655	12,400	-	-
1971 ^c	256	-	-	1,047	-
1972 ^d	561	2,332	54,934	-	-
1973 ^d	298	4,332	26,542	-	-
1974 ^d	220	861	154,285	-	-
1975 ^e	60	5,237	17,885	-	-
1976 ^e	66	196	10,606	-	-
1977	1,275	8,139	4,565	-	-
1978	321	9,349	21,813	-	-
1979	735	1,130	9,500	-	-
1980	61	2,300	127,900	-	204
1981	68	405	575	-	263
1982	8	599	173,352	-	4,145
1983	347	4,135	4,980	-	-
1984 ^d	2,844	2,915	458,387	-	152 ^f
1985 ^d	1,426	4,567	4,360	-	2,045
1986 ^d	1,613	3,738	236,487	-	-
1987	445	392	0	-	680
1988	202	30	112,770 ^g	-	240
1989 ^c	-	-	-	-	-
1990	255	510	25,685	-	-
1991	656	2,435	118,720	-	2,510
1992	329	-	631,140	-	398
1993	900	445	13,570	-	1,397
1994	No survey due to poor conditions				-
1995	622	1,370	18,300	-	690 ^c

^a Represents "high count" for season.^b Surveyor unable to distinguish between the two species.^c Poor survey conditions or partial survey, poor counting tower conditions.^d Total counts obtained from counting tower.^e Combined tower and aerial survey counts below the tower.^f Aerial survey; not tower count.^g Helicopter survey.^h Boat survey.ⁱ Foot survey.^j Includes counts from Casadepaga and Ophir Creeks.^k Includes counts from Ophir Creek.^l Numerous pink salmon made enumerating of chum salmon difficult; pink count may include some chum.

PORT CLARENCE DISTRICT

District Boundaries

The Port Clarence district encompasses all waters from Cape Douglas north to Cape Prince of Wales including the Salmon Lake and Pilgrim River drainage (Figure 2). Salmon, saffron cod, whitefish and herring are the major subsistence species; however, other fishery resources are also utilized.

Commercial Fishery

Commercial salmon fishing in this district has been prohibited since 1967. In 1966 a total of 1,216 salmon consisting of 93 sockeye, 131 pinks and 922 chums was taken commercially in the Grantley Harbor/Tuksuk Channel area. A few salmon are sold or bartered each year in Teller and Nome. Due to the relatively small runs in this area and the existence of an important subsistence fishery, commercial salmon fishing has not been reopened.

Subsistence Fishery

A traditional subsistence salmon fishery has probably occurred within this district for centuries; however, subsistence fishing has only been reported or monitored at Salmon Lake since the 1930's and upper Pilgrim River since 1962. Data collected by Department personnel has indicated a majority of the fishermen of Brevig Mission fish the northern and northeastern sections of Port Clarence, while Teller fishermen utilize Grantley Harbor and Tuksuk Channel. Interviews with local residents have also indicated substantial fishing effort within the Agiapuk River. Village subsistence surveys had been conducted annually by the Division of Commercial up until 1983 (Appendix Table B1). Subsistence Division conducted a partial survey of Brevig Mission in 1989 and conducted a full scale survey of both villages in 1994 and 1995. Personal interviews with fishermen seem to indicate a decline in subsistence fishing effort, due primarily to the absence of younger fishermen entering the fishery. A majority of the subsistence fishing effort appears to be conducted by elder residents who gather fish for an entire family.

A summary of the subsistence salmon harvest estimates by community is presented in Table 10. The estimated subsistence harvest of salmon in the Port Clarence District in 1995 was 15,600 fish. Of these, 76 were chinook salmon, 6,011 were chum, 3,293 were pink, 4,481 were sockeye, and 1,739 were coho. The estimated mean harvest was 103 salmon per household (1 chinook, 40 chum, 22 pink, 30 sockeye, and 12 coho). About 64 percent of Port Clarence households fished for subsistence salmon in 1995. Fifty-eight percent of the households surveyed replied "yes" when asked whether their subsistence salmon needs had been met. An estimated 535 salmon were harvested for dog food.

Salmon Lake and Pilgrim River stocks have been utilized primarily by Nome residents. The Alaska Board of Fisheries adopted a regulation in 1972 which closed Salmon Lake and its tributaries to subsistence salmon fishing from July 15 through August 31 to conserve declining sockeye salmon

stocks. Subsistence fishing permits are required for the Pilgrim and Kuzitrin Rivers. Beginning in the 1991 season, a dramatic increase in the number of subsistence permits issued to Nome residents intending to fish in the area was observed. This was due in part to a strong sockeye salmon return. Another reason was the extensive subsistence fishing closures in the Nome area which made the Pilgrim River an alternative location to obtain their subsistence needs.

The Pilgrim River and its tributaries were closed to subsistence salmon fishing in 1995 from August 25 through September 15. The coho salmon returns to the Port Clarence District were particularly weak as with northwestern Norton Sound. The department does not usually assess the coho salmon stocks in the district. It was out of public concern that this action was taken to bolster coho salmon escapement while protecting coho salmon already in spawning areas. Subsistence salmon harvest by Nome residents for 1995 in the Port Clarence Districts can be found in Table 2 and subsistence survey information which includes households in Teller and Brevig Mission can be found in Appendix Table B1.

Escapement

Aerial surveys are not typically flown in this district, with the exception of Salmon Lake, due to the low priority assigned to areas which do not support commercial fisheries. Aerial surveys show an increasing trend of sockeye returns to Salmon Lake since 1986 (Appendix Table B2). The 1995 aerial survey count of 5,433 red salmon is the highest on record since 1963. Recent year counts are in the upper end of the range and reflect an increasing population of red salmon.

Table 10. 1995 Port Clarence subsistence salmon harvests.

			Chinook		Chum		Pink		Sockeye		Coho		Total	
	Total HH's	HH's Contacted	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total
Brevig Mission	59	53	3	3	1,720	1,869	1,842	1,976	1,626	1,741	883	945	6,074	6,533
Pilgrim R. Permits**	14	9	4	8	6	12	0	0	99	177	6	8	115	204
Teller	78	60	52	64	3,330	4,130	1,061	1,317	2,067	2,564	634	787	7,144	8,862
PORT CLARENCE	151	122	59	76	5,056	6,011	2,903	3,293	3,792	4,481	1,523	1,739	13,333	16,600

* If less than 30 or 50% of households in a community were contacted, then reported harvest is used for estimated harvest.

** Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, permit returns, 1995. Expansion is by drainage.

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, household surveys, 1995.

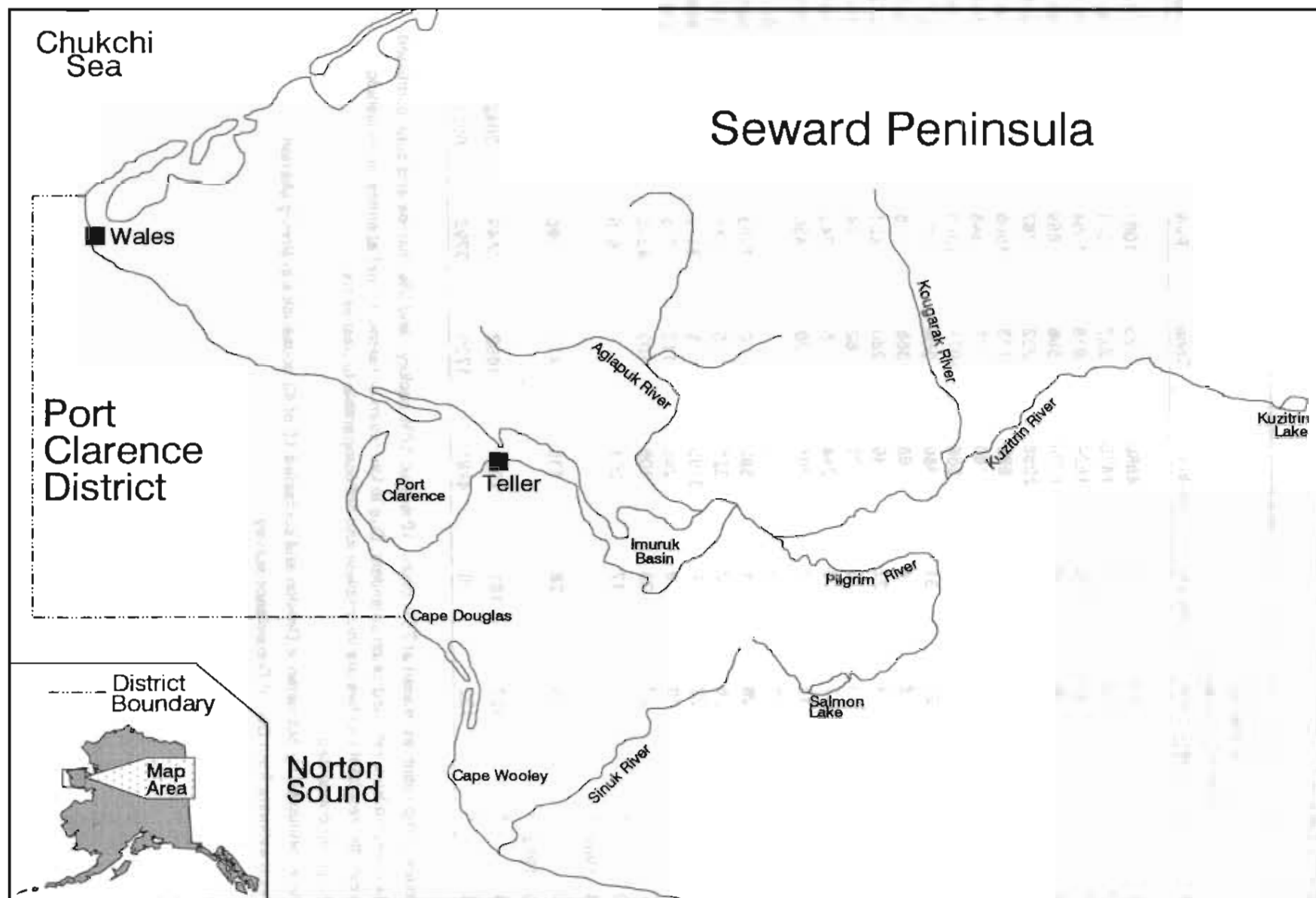


Figure 2. Port Clarence District.

Appendix Table B1.

Year	Number of Fishing Families Interviewed	Chinook	Sockeye	Coho	Pink	Chum	Total
1963	19	9	4866	25	1061	1279	7240
1964	22	17	1475	227	371	1049	3139
1965	29	36	1804	639	1854	1602	5935
1966	26	10	1000	896	859	2875	5640
1967	19	12	2068	232	767	1073	4152
1968	24	40	688	133	1906	904	3671
1969	13	2	180	27	548	932	1689
1970	18	4	588	1071	1308	4231	7202
1971	22	31	850	959	1171	3769	6780
1972	8	4	68	388	75	2806	3341
1973	4	22	46	280	424	1562	2334
1974	13	0	28	62	14	2663	2767
1975	17	0	244	5	743	1589	2581
1976	15	7	291	20	436	6026	6780
1977	^a 13	-	-	-	-	-	5910
1978	26	1	392	0	7783	705	8881
1979	26	0	320	35	741	1658	2754
1980	22	7	3195	5	3170	1715	8092
1981	10	8	255	110	765	5845	6983
1982	27	23	405	100	4345	684	5557
1983	^b 3	17	261	-	615	299	1192
1984 - 1988	^c						
1989	^d 15	28	535	472	395	410	1840
1990 - 1993	^c						
1994	^e 127	181	1979	1692	3849	2042	9743
1995	^e 122	76	4481	1739	3293	6011	15600

^a Species composition estimated at 75% chum, 10% pink, 10% sockeye and 5% chinook and coho combined.

^b Data collected from returned catch calendars. Due to low return of calendars and absence of household surveys, the resultant catches are incomplete and not comparable to past years.

^c Surveys not conducted.

^d Survey conducted by Subsistence Division and contacted 15 of 43 households in Brevig Mission.

^e Harvest estimate from Div. of Subsistence survey.

Appendix Table B2. Comparative sockeye salmon aerial survey indices, Port Clarence District, 1963 -1995.

Year	Salmon Lake	Grand Central River	Total
1963	866	620	1486
1964 ^c	76	590	666
1965	250	160	410
1966	1120	370	1490
1967	129	280	409
1968 ^c	830	645	1475
1969	24	171	195
1970 ^a	-	-	-
1971	538	512	1050
1972 ^c	680	300 ^b	980
1973	1747	607	2354
1974	820	0	820
1975	537	123	660
1976	132	22	154
1977	317	235	552
1978	822	280	1102
1979	1250	261	1511
1980 ^c	512	175	687
1983	970	-	970
1984	445	30	475
1985	730	250	980
1986	2125	160	2285
1987	4040	530	4570
1988	1195	6	1201
1989	3055	525	3591
1990	2834	926	3760
1991	3790	1570	5360
1992	1500	^a	1500
1993	2885	216	3092
1994	3740	1230	4970
1995	5433	628 ^d	6061

^a No survey made.

^b Boat survey.

^c Poor survey.

^d Early count.

KOTZEBUE SOUND DISTRICT

History

The Kotzebue District supports the northernmost commercial salmon fishery in Alaska (Figure 3). The Kotzebue District is broken down into three sub-districts with Sub-district 1 containing 6 statistical areas (Figure 4). The recent commercial fishery opened under state management in 1962. Salmon harvests consist primarily of chum salmon, although a few chinook salmon and Dolly Varden are incidentally harvested. There are 215 commercial permit holders, of which an average of 146 per year were active over the recent 10 year period (1986-1995). Eighty-seven percent are residents of the district and 99 percent are state residents.

The earliest sales of salmon in the Kotzebue District were in 1909 when Lockhart's store handled 21,906 pounds of salmon purchased from Eskimos and was resold at \$.05/lb. Of this, 21,366 lbs. were sold to gold miners in the Kobuk River drainage and 540 lbs. were sold to a company in Seattle. A commercial fishery occurred between 1914-1918 when salmon were canned and the bulk of it was also thought to have been sold to miners working in the Upper Kobuk. After state management began in 1962, the fishery became fully developed during the mid-70's. Since that time, the fishery has displayed a cyclic pattern of harvest with alternating and declining strong and weak returns over four year intervals (Appendix Table C.1., Figure 5). In 1987, the Department began a rebuilding program with an emphasis on attaining escapement goals. Prior to 1987, commercial harvest were more in proportion to the annual chum return. Current fisheries management is based on a comparison of age composition and catch rate in the commercial fishery to the average statistics at the same point in the season historically, since 1978. The department is relying more on a sonar on the Noatak River during the latter third of the season when Noatak stocks are predominant.

By regulation, the Kotzebue commercial salmon fishery is limited to set gill nets with a limit of 150 fathoms of gear per fisherman. Fishermen generally operate with one end on or near shore and with all three shackles (50 fathoms per shackle) connected. A few fishermen also set in deeper channels in the mud flats further out from shore. Most gear used in the district is 5-7/8 in (14.9 cm) stretch multifilament gill net.

General Information

The Commercial harvest in the Kotzebue District (Figure 4,) during 1995 consisted of 290,730 chum salmon, 5 chinook salmon, and 2,090 Dolly Varden (Table 9, Appendix Table C.5.). This commercial chum harvest was near the mid-range of the projected 250,000-350,000 salmon. This catch was just above the 16 year average of 282,000. There were 92 permits that fished this year. This is the lowest amount of participants since 1971. The low fishing effort is attributed to construction opportunities available in the region and the lowest salmon prices since 1967 (Appendix Table C.4.).

A total of thirty openings were fished in 1995 for a total of 232 hours. Even though this was the most openings ever fished, only 1993 had fewer hours fished since the fisheries inception in 1962. This was

about half of the recent 16 year average. Commercial fishing period lengths varied from 2 hours to 24 hours in length during the 1995 season.

Two buyers purchased a total of 2,329,898 pounds (Appendix Table C.2.) of chum salmon at \$.13 per pound, 93 pounds of chinook salmon at an average of \$1.00 per pound, and 13,195 pounds of Dolly Varden at an average of \$.20 per pound. The total ex-vessel value was \$316,031 to Kotzebue area fishermen with an average of \$3,435 for each participating permit holder. Chum salmon accounted for \$305,619 of the value (Appendix Table C.3). Both buyers ice packed their fish and flew them out in the round to Anchorage for processing.

Inseason Management

Primary fishery management objectives were to provide adequate chum salmon escapement through the commercial fishery: (1) to ensure sustained runs by allowing adequate natural escapement, and (2) to meet subsistence harvest needs. Fishery management depended on comparing period and cumulative season catch rates to that of previous years. A comparison of catch rates over the history of the fishery has shown a close relationship to the total run strength. Because of a lack of experienced sonar project leaders, the Noatak River sonar was not in operation in 1995. Noatak River sonar escapement counts had been used with strong consideration in the management of the final third of the season.

Age composition of catches are also closely monitored to determine the strength of age classes in the return. Older salmon tend to migrate into freshwater first; a fact that affects catch rate as the season progresses and affects the fishery managers evaluation of the catch statistics. Weak 3 and 4 year old age classes will tend to depress mid-season catches (Table 12, Figure 7).

A preseason meeting was held with fishermen to discuss inseason management. A processor representative was also present. Both the processor and the department warned fishermen of the poor market conditions for chum salmon. Fishermen were told that periods would be shorter but could be more frequent as long as escapements were being achieved. This would ensure a marketable quality that would allow the fishery to continue. The processors representative warned that a single period of poor quality fish could end the fishery in Kotzebue because of the narrow profit margins processors were working with. Because of the strong run and management determined by markets, no other meeting was held by the department.

Contact with the Kobuk River subsistence fishermen was maintained. A test fishery occurred for the third year on the Kobuk River, however, test fish indices were not used for management purposes because of the lack of historical data. Information from the Kobuk River test fishery is available in report form. A Noatak River test fish project was also operated and those results are also available in a separate report.

Commercial Season Summary

The Kotzebue Sound commercial salmon season was opened July 10 by emergency order as established by regulation. The first three periods are 24 hours in length to assess the early portion of the run as there are no other indicators. Commercial catch for the first 3 periods nearly mirrored the recent 16 year average while catch per unit effort (CPUE) was 3-4 times the average (Table 11, Figure 6). Catch and catch rates for the first 3 periods indicated the chum salmon run to be above average in strength. With this information, processors were concerned the harvest might exceed what they could market and requested a reduction in period length.

The next two periods (4 and 5) were 12 hours in length. Even with shorter hours and few fishermen, catch was above normal and catch rates were still several times greater than the historical average. This high harvest rate prompted processors to limit their buyers to purchase a limited poundage. The purchasing cap changed throughout the season based on the current processing capacity, ice, tote and airlift availability. Buyers were in contact daily with the department. The number of hours to be fished was negotiated between the two buyers by the department and announced to fishermen via KOTZ Radio and citizens band radio by 11:00 a.m. The fishing periods usually began in the early evening.

As the coho salmon run picked up in other areas of the state, one buyer pulled out leaving only one buyer to purchase Kotzebue chum salmon. This also coincided with the peak of the chum salmon run, the first week of August. The remaining buyer, fearful of quantities more than he or his processor could market, decided to develop a plan to control the quantity of salmon to be purchased if his processors market became limited. An announcement was made by the buyer that if the market dropped off, he would only buy from 10 fishermen. This way he could essentially control the quantity harvested. To be fair to his fishermen and to "non-loyal" fishermen, he would pick 5 of his fishermen and draw names of 5 more active fishermen. The buyer held a meeting on August 5 when the drawing took place. This limitation of fishermen could go into effect at anytime and would be announced prior to the commercial opening. The processor continued to find viable markets and the fishery was never limited to the 10 fishermen but fishing time was still an essential tool in limiting the harvest.

The remaining buyer contacted the department concerning the possibility of using an average weight for all chum salmon. Because of the quantities of salmon being delivered and a dock crew plagued with frequent turnover, he wanted to count the number of fish and use an average weight so that each individual fish did not have to be weighed. According to Alaska Statute 16.10.270 (a), averaging the individual salmon can be done if the "primary fish buyer and the seller agree in writing on a upon a sample weighing technique that will fairly determine the average weight of the fish purchased". Fishermen agreed to this and the buyer began using the season average weight of 8 pounds for each fish sold on August 8. He continued purchasing fish in this manner for the remainder of the season. As the salmon diminished, hours were increased. The last 5 openings (26-30) were all 12 hours in length and announced the previous afternoon.

Age-5 salmon tend to dominate the earlier commercial openings with the younger age classes moving through during the middle and latter part of the fishery. This was also true for 1995. A higher than average number of age-5 fish were found compared to historical averages. Age-3 salmon were in normal abundance during the first half of the season but declined to roughly half of average in the latter

portion of the season. This may be the result of a recent trend of fewer young fish returning to spawn (Appendix Table C.9.).

For the second year, there was no Fish and Wildlife Protection Officer in Kotzebue. Work loads prevented the Nome protection officer from patrolling the fishery. Reports of fishing after the closure began as early as the third week of the fishery and continued until the end of the season when fishing late seemed more of the norm than complying with the closure time. With the buyer restricted to a limited poundage, excess catches due to fishermen fishing late could have easily swamped the buyer and ended the commercial fishery. As a preventative measure, the buyer began giving fishermen a limited time frame to deliver fish after the ending of each period.

Sikusuilag Hatchery

The total predicted return of hatchery salmon was 82,000. There was an estimated commercial harvest of 57,000 chum salmon from the hatchery. With the exception of two periods after August 15, the hatchery contributed between 20% - 35% to the commercial harvest. Because of the poor market conditions, there was no interest in harvesting the excess salmon at the hatchery.

The 1995 spring release of fry may be the last from Sikusuilag Hatchery as the state has ceased operations due to budget cuts. Currently the state is in the process of turning over the hatchery to the Northwest Arctic Borough. At the time of this report, there are no known plans to re-open the hatchery.

Escapement

A test fishing project located in Kiana monitored salmon run strength and timing into the Kobuk River. The test fish crews in Kiana also visited with subsistence fishermen to monitor subsistence catches. Even though a sonar project did not operate this year on the Noatak River, a reduced crew continued test fishing to monitor escapements into the Noatak River.

The test fish index from the Kobuk River was similar to last years strong run, though the project did not operate as long (Table 13, Figure 9). Even with the clear water conditions, catch rates did not seem to be significantly affected. Most likely, catch rates would have been higher if water had been more turbid. However, affects of clear water net avoidance was significantly buffered because of the tannic stained water of the Kobuk River. The last two years have proven that the Kobuk River test fish project can be operated in extreme high and dirty water years like 1994, or low and clear water years like 1995.

As mentioned previously, only the test fishing portion of the Noatak River sonar project was operated this year. A two person crew operated a test fish project, identical to the test fishery used for species apportionment when the sonar is in operation. This level of operation maintained the apportionment data base while monitoring escapement into the Noatak. This year's data was compared to the

previous two years (1993 and 1994) test fish data from the right bank. The result was that the 1995 cumulative CPUE was the lowest of the three years (Table 14, Figure 10). This is attributed to net avoidance due to extreme water clarity. Only a few days of high catch rates occurred and those were during periods of higher turbidity. This year's poor performance is identical to 1991 when the test net project indicated a poor chum salmon run while aerial surveys indicated escapements were met. If management in 1991 and 1995 were dependent on test fishing, the commercial fishery would have been severely restricted, even though escapements were average and well above average as indicated by commercial catch rates and aerial surveys. Both 1991 and 1995 show that test net catches are not an indices of total salmon escapement into the Noatak River.

This year's aerial survey conditions were some of the best in recent history. Of the ten scheduled surveys, nine were flown and were considered fair or better. The one survey not flown was due to the lack of a survey pilot, not because of poor weather. Aerial escapement goals on all tributaries, with the exception of the Squirrel River, were roughly doubled. The Squirrel River escapement goal was essentially met. Run timing, by aerial survey, was normal with two exceptions, the Salmon River and the Upper Kobuk area. These two index areas indicated an earlier than normal run. The department missed a tremendous opportunity to compare aerial survey counts to sonar counts on the Noatak River. The surveys of only two other years (1976 and 1982) in the last twenty-five equaled or exceeded this year's number of aerial survey flights (Appendix Table C.8. and Figure 8).

Dolly Varden

In the previous two years, the incidental catch of Dolly Varden (locally called trout) was virtually non-existent because of closed periods or shorter openings. This year, commercial fishing occurred during what is normally the time period when the Dolly Varden migrate through the district. The incidental harvest was higher than normal at 2,090 (Appendix Table F.4.). Spawners and wintering Dolly Varden normally migrate through the district during the third week of August. The Dolly Varden were larger and more numerous, making them vulnerable to commercial gear. Because of the lowest prices in nearly 30 years for chum salmon, fishermen operated near town and did not fish where the bulk of the trout migration occurs (Table 10).

Freshwater Fisheries

Limited commercial harvest of miscellaneous finfish has been allowed since statehood, normally under the auspices of a permit which delineates harvest levels, open areas, legal gear, etc. There was no reported commercial harvest of whitefish, pike, or burbot during the 1995 commercial salmon season. Sheefish are caught and sold predominantly between mid-November and late March. Only one fishermen reported sales of sheefish this year, 161 fish with a weight of 1,840 pounds (Appendix Table F.1.).

A cooperative tagging project on sheefish in the Kotzebue District began in 1994. This study is being conducted by Sport Fish, U.S. Fish & Wildlife Service (USFWS) and the National Park Service (NPS).

Spawning sheefish were tagged in the Upper Kobuk River and the Selawik River. Roughly 600 sheefish were tagged in the Kobuk River and 150 in the Selawik River in 1994. During the fall of 1995, roughly 600 sheefish were tagged in the Upper Selawik River by the USFWS. Division of Sport Fish tagged approximately 950 sheefish in the Upper Kobuk River. Between 30-40 tags have been turned in the last year. There are now approximately 2,500 tagged sheefish in the region. The results of the study should provide an estimate of the spawning sheefish populations, information on migration patterns and to see if the two stocks mix in the over-wintering area of Kobuk and Selawik Lakes.

Subsistence

Funding for a second year was available allowing Subsistence Division to conduct door to door subsistence fish surveys in all of the villages on the Kobuk River and the village of Noatak. A mail survey was conducted in the City of Kotzebue and a comprehensive baseline harvest survey in Shishmaref. A summary of the subsistence salmon harvest estimates by community is presented in Table 17. The estimated subsistence harvest of salmon in the Kotzebue Sound District was 108,662 fish, 95 percent of which were chum salmon. Estimated mean salmon harvest was 82 salmon per household (77 chum, 2 pink, 1 sockeye, 2 coho). Fifty-two percent of the households surveyed subsistence fished for salmon in 1995. Seventy-four percent of the surveyed households responded "yes" when asked whether their salmon needs had been met in 1995. An estimated 13,108 salmon were harvested for dog food. Historical information for chum salmon can be found in Appendix Tables C.6. and C.7.

The overall consensus was that there were plenty of salmon. Low water allowed easy access to migrating chum salmon. An elder from the village of Noatak said he had never seen this many fish before. A longer than normal fall did not allow people to freeze harvested fish. Some spoilage did occur but because of the strong run and easy access, those people were able to harvest fish and meet their needs after freezing began.

1996 Outlook

The outlook for the 1996 season is based on the returning age classes of the 1995 season. During the 1996 season, the four year old age component of the run is expected to be near average, while the five year old component is expected to be above average. The three year old component is generally small, and it too is likely to be near average. The commercial harvest is expected to fall within the range from 250,000 to 350,000 chum salmon, assuming an adequate market.

Table 11. Commercial catches of chum salmon, chinook salmon, and Dolly Varden by period in the Kotzebue District, 1995.

Period	Date	Hours Fished	Number of Fishermen	Chum ^a			Chinook			Dolly Varden		
				Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	July 10-11	24	9	2,483	20,075	8.1	1	31	31.0	1	4	4.0
2	July 13-14	24	19	8,834	70,089	7.9						
3	July 17-18	24	34	17,239	138,259	8.0						
4	July 19-20	12	36	10,329	82,703	8.0				5	26	5.2
5	July 20-21	12	42	11,193	91,394	8.2	1	21	21.0	4	26	6.5
6	July 21-22	4	13	3,002	23,844	7.9						
7	July 24	4	30	7,625	59,945	7.9						
8	July 25	6	33	12,017	96,214	8.0						
9	July 26	3	29	7,827	62,158	7.9						
10	July 28	4	44	18,281	147,103	8.0				5	43	8.6
11	July 31	3	48	11,207	89,901	8.0				34	25	0.7
12	August 1	3	47	7,967	65,609	8.2						
13	August 2	2	41	10,313	83,350	8.1						
14	August 4	2	37	6,322	50,212	7.9						
15	August 7	2	41	10,970	87,469	8.0						
16	August 8	3	44	12,972	103,779	8.0 ^b						
17	August 9	3	40	11,290	90,320	8.0 ^b						
18	August 10	3	48	13,723	109,784	8.0 ^b				3	45	15.0
19	August 11	3	37	13,083	104,664	8.0 ^b						
20	August 14	2	19	3,212	25,696	8.0 ^b				10	70	7.0
21	August 15	4	29	5,726	45,768	8.0 ^b	1	6	6.0	183	1,078	5.9
22	August 16	6	36	11,824	94,592	8.0 ^b				238	1,483	6.2
23	August 17	8	39	19,223	153,784	8.0 ^b				259	1,469	5.7
24	August 18	4	23	4,899	39,192	8.0 ^b				157	931	5.9
25	August 21	7	33	6,775	54,235	8.0 ^b				298	1,954	6.6
26	August 22	12	37	8,676	69,488	8.0 ^b				304	1,993	6.6
27	August 23	12	27	8,366	66,928	8.0 ^b				191	1,290	6.8
28	August 24	12	28	9,717	78,216	8.0 ^b				241	1,701	7.1
29	August 25	12	28	8,226	65,808	8.0 ^b				101	631	8.2
30	August 28	12	22	7,409	59,319	8.0 ^b	2	35	17.5	56	426	7.6
Totals		232	92	290,730	2,329,898	8.0	5	93	18.6	2,090	13,195	6.3

^a Does not include 125 chum salmon at 1,005 pounds from test fish sales.

^b Commercial fishermen and the lone buyer have agreed to average the weight of the fish so each individual catch does not need to be weighed. The average weight is based on the previous commercial catches, an average of 8.0 pounds.

Table 12. Kotzebue District commercial chum salmon, chinook salmon, and Dolly Varden catch by statistical area, 1995.

Statistical Area	Chum CPUE	Number of Fishermen	Chum *			Chinook			Dolly Varden		
			Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	12.1	83	232,615	1,862,703	8.01	4	72	18.00	1,543	9,667	6.27
331-02	4.1	17	16,346	131,074	8.02	1	21	21.00	365	2,332	6.39
331-03	1.9	11	4,854	38,970	8.03				13	57	4.38
331-04	5.1	11	12,927	103,257	7.99				76	560	7.37
331-05	1.9	4	1,806	14,653	8.11						
331-06	6.8	14	22,182	179,241	8.08				93	579	6.23
Totals	13.6	92	290,730	2,329,898	8.01	5	93	18.60	2,090	13,195	6.31

* Does not includes 125 chum salmon (1,005 lbs.) caught and sold from the Noatak R. test fish project.

Table 13. Kotzebue Sound chum salmon 1995 commercial and 16 year average catch statistics (1979-1994).^a

Average (1979-1994)					Cumulative			
Period	Hours	Number Permits	Catch (x 1,000)	CPUE	Prop. Catch	Catch (x 1,000)	CPUE	Prop. Catch
1	24	41	3.1	3.1	0.011	2.9	3.1	0.011
2	24	67	5.2	3.1	0.018	8.1	3.1	0.032
3	24	93	10.1	4.7	0.036	18.2	3.8	0.074
4	25	113	18.5	6.4	0.066	36.7	4.8	0.142
5	27	125	22.9	6.5	0.081	59.7	5.3	0.226
6	30	134	31.5	7.8	0.112	87.3	5.9	0.320
7	35	135	37.5	8.8	0.133	122.4	6.3	0.461
8	38	142	41.0	9.2	0.145	160.9	6.6	0.589
9	40	133	38.5	7.3	0.136	199.3	6.8	0.739
10	38	136	43.8	10.6	0.155	237.7	6.9	0.838
11	41	126	25.0	5.9	0.089	258.0	6.8	0.916
12	42	110	14.7	3.8	0.052	269.9	6.5	0.958
13	41	83	9.4	3.1	0.033	277.5	6.3	0.984
14	39	64	6.0	2.4	0.021	280.9	6.2	0.995
15	41	39	2.8	1.8	0.010	282.3	6.2	1.000

Year: 1995					Cumulative			
Period	Hours	Number Permits	Catch ^a (x 1,000)	CPUE	Prop. Catch	Catch (x 1,000)	CPUE	Prop. Catch
1	24	9	2.5	11.5	0.009	2.5	11.5	0.009
2	24	19	8.8	19.4	0.030	11.3	16.8	0.039
3	24	34	17.2	21.1	0.059	28.6	19.2	0.098
4	28	51	24.5	17.2	0.084	53.1	18.2	0.183
5	13	47	27.5	45.0	0.094	80.5	22.8	0.277
6	4	44	18.3	103.9	0.063	98.8	26.7	0.340
7	8	64	29.5	57.6	0.101	128.3	30.4	0.441
8	2	37	6.3	85.4	0.022	134.6	35.6	0.463
9	8	53	35.2	83.1	0.121	169.9	36.0	0.584
10	6	50	26.8	89.4	0.092	196.7	39.2	0.676
11	12	41	20.8	42.2	0.071	217.4	39.5	0.748
12	12	44	24.1	45.7	0.083	241.6	40.0	0.831
13	31	44	23.8	17.5	0.082	265.4	35.9	0.913
14	24	35	17.9	21.4	0.062	283.3	34.4	0.975
15	12	22	7.4	28.1	0.025	290.7	34.2	1.000

^a Does not include 125 chum salmon sold from the Noatak R. test fish project.

Table 14. Historical average age composition by period for the recent 16 years (1979-1994) and 1995.

16 Year Avg.		Percent				Catch by Age			
Period	Catch	3	4	5	6	3	4	5	6
1	3,144	0.4	34.6	60.9	4.1	12	1,088	1,915	129
2	5,188	0.9	41.6	53.1	4.4	47	2,158	2,755	228
3	10,100	1.4	40.7	51.9	6.0	141	4,111	5,242	606
4	18,509	1.4	49.1	45.9	3.6	259	9,088	8,496	666
5	22,906	1.4	47.2	46.7	4.7	321	10,812	10,697	1,077
6	31,542	1.9	54.2	41.4	2.6	599	17,096	13,058	820
7	37,477	3.0	56.8	38.0	2.2	1,124	21,287	14,241	824
8	41,039	4.4	61.9	32.0	1.8	1,806	25,403	13,132	739
9	38,486	6.3	59.0	32.3	2.5	2,425	22,707	12,431	962
10	43,795	6.1	63.5	29.0	1.4	2,671	27,810	12,701	613
11	25,014	11.2	65.5	22.3	1.0	2,802	16,384	5,578	250
12	14,661	12.4	60.1	25.5	2.0	1,818	8,811	3,739	293
13	9,387	13.1	63.6	21.8	1.5	1,230	5,970	2,046	141
14	5,991	11.3	62.6	25.3	0.8	677	3,750	1,516	48
15	2,783	4.8	67.8	26.4	1.1	134	1,887	735	31

Kotzebue Sound commercial catch and age composition, 1995.

		Percent				Catch by Age			
Period	Catch	3	4	5	6	3	4	5	6
1	2,483	0.0	28.7	64.8	6.5	0	713	1,609	161
2	8,834	0.4	31.0	64.9	3.7	35	2,739	5,733	327
3	17,239	2.0	47.6	47.6	2.8	345	8,206	8,206	483
4	24,544	0.4	54.7	43.4	1.5	98	13,426	10,652	368
5	27,525	2.1	56.6	38.3	3.0	585	15,588	10,529	823
6	18,281	1.7	60.2	36.4	1.7	311	11,005	6,654	311
7	29,536	1.2	65.2	31.7	1.6	341	19,260	9,368	479
8	6,322	3.1	55.5	39.3	2.2	196	3,509	2,485	139
9	35,232	1.4	64.4	32.8	1.4	493	22,689	11,556	493
10	26,806	3.3	58.2	36.8	1.7	885	15,601	9,865	456
11	20,762	5.0	73.7	25.0	1.3	1,038	15,302	5,191	270
12	24,122	3.6	62.7	31.9	1.8	868	15,124	7,695	434
13	23,817	2.9	59.4	36.6	1.1	691	14,147	8,717	262
14	17,943	2.0	56.3	39.0	2.7	359	10,102	6,998	484
15	7,409	4.2	66.3	27.7	1.9	311	4,912	2,052	141

Table 15. Kobuk River drift test fish historical mean daily CPUE and cumulative CPUE, 1993-1995. *

Date	1993		1994		1995	
	Daily	Cum.	Daily	Cum.	Daily	Cum.
10-Jul						
11-Jul						
12-Jul	11.18	11.18				
13-Jul	14.22	25.40	0.00	0.00	0.93	0.93
14-Jul	20.57	45.97	2.68	2.68	2.80	3.73
15-Jul	35.08	81.05	2.58	5.26	2.77	6.50
16-Jul	13.19	94.24	11.35	16.61	^b	6.50
17-Jul	17.27	111.51	^b	16.61	0.00	6.50
18-Jul	^b	111.51	7.16	23.77	1.81	8.31
19-Jul	10.71	122.22	12.40	36.17	9.89	18.20
20-Jul	2.78	124.98	3.65	39.82	16.30	34.50
21-Jul	3.20	128.18	7.30	47.12	38.54	73.04
22-Jul	5.52	133.70	3.56	50.68	21.18	94.22
23-Jul	27.15	160.85	16.49	67.17	50.58	144.80
24-Jul	9.06	169.91	^b	67.17	28.46	173.26
25-Jul	^b	169.91	14.38	81.55	40.16	213.42
26-Jul	15.22	185.13	47.65	129.20	35.15	248.57
27-Jul	8.06	193.19	40.66	169.86	63.94	312.51
28-Jul	16.36	209.55	57.83	227.69	62.49	375.00
29-Jul	0.93	210.48	33.62	261.31	46.11	421.11
30-Jul	0.92	211.40	89.21	330.52	⁺	478.97
31-Jul	12.58	223.98	^b	330.52	29.89	508.86
01-Aug	^b	223.98	82.16	412.68	72.91	581.77
02-Aug	6.74	230.72	65.12	477.80	48.71	630.48
03-Aug	54.49	285.21	⁺	549.59	48.40	678.88
04-Aug	44.23	329.44	108.98	658.57	⁺	731.88
05-Aug	89.30	418.74	⁺	718.31	49.95	781.83
06-Aug	18.60	437.34	102.56	820.87	^b	781.83
07-Aug	20.52	457.86	^b	820.87	46.39	828.22
08-Aug	^b	457.86	62.75	883.62	44.02	872.24
09-Aug	1.84	459.70	96.86	980.48	⁺	940.46
10-Aug	12.63	472.33	45.83	1,026.31	56.33	996.79
11-Aug	18.11	490.44	57.02	1,083.33	37.95	1,034.74
12-Aug	3.74	494.18	90.54	1,173.87	63.92	1,098.66
13-Aug			11.36	1,185.23	^b	1,098.66
14-Aug			^b	1,185.23	29.35	1,128.01
15-Aug			5.13	1,190.36	25.26	1,153.27
16-Aug			16.23	1,206.59	35.04	1,188.31
17-Aug			0.00	1,206.59		
18-Aug			0.00	1,206.59		
19-Aug			3.12	1,209.71		
20-Aug			0.00	1,209.71		
21-Aug			^b	1,209.71		
22-Aug			0.00	1,209.71		
23-Aug			0.00	1,209.71		
24-Aug			0.00	1,209.71		
25-Aug			0.91	1,210.62		
26-Aug			5.56	1,216.18		
27-Aug			1.86	1,218.04		
28-Aug			0.93	1,218.97		
29-Aug			0.00	1,218.97		
30-Aug			0.00	1,218.97		

* Quartiles are indicated by "+" and the mid-points are indicated by "".

^b Regular day off.

Table 16. Noatak River test fish mean daily and cumulative CPUE for the right bank, 1993-1995

Date	1993		1994		1995	
	Daily	Cum.	Daily	Cum.	Daily	Cum.
17-Jul						
18-Jul	21.51	21.51				
19-Jul	149.06	170.57			0.00	0.00
20-Jul	0.00	170.57			98.18	98.18
21-Jul	10.70	181.26				98.18
22-Jul	0.00	181.26	10.90	10.90	0.00	98.18
23-Jul	0.00	181.26	129.49	140.38	211.76	309.94
24-Jul	30.14	211.40	146.85	287.23	224.68	534.62
25-Jul	0.00	211.40	13.95	301.18	20.87	555.49
26-Jul	0.00	211.40	69.97	371.15	93.91	649.40
27-Jul	34.95	246.35	21.47	392.62	40.85	690.25
28-Jul	115.71	362.06	197.71	590.34		690.25
29-Jul	0.00	362.06	530.30	1,120.63		707.39
30-Jul	21.45	383.51	136.45	1,257.09	17.14	789.09
31-Jul	173.82	557.33	319.26	1,576.35	81.70	894.97
01-Aug	63.86	621.19	420.33	1,996.68	105.88	945.12
02-Aug	141.39	762.58	155.86	2,152.55	50.15	945.12
03-Aug	157.72	920.30	221.54	2,374.08		994.53
04-Aug	213.41	1,133.71	115.53	2,489.61	49.41	1,025.17
05-Aug	72.65	1,206.36	460.01	2,949.63	30.64	1,168.15
06-Aug	293.10	1,499.46	693.97	3,643.60	142.98	1,251.63
07-Aug	175.17	1,674.63	342.28	3,985.87	83.48	1,371.63
08-Aug	98.43	1,773.06	992.13	4,978.01	120.00	1,541.63
09-Aug	239.43	2,012.49	843.96	5,821.96	170.00	1,541.63
10-Aug	373.33	2,385.82	105.55	5,927.51		1,711.63
11-Aug	317.81	2,703.63	387.18	6,314.69	170.00	2,066.41
12-Aug	479.00	3,182.63	465.02	6,779.71	354.78	2,066.41
13-Aug	261.64	3,444.27	236.55	7,016.26		2,066.41
14-Aug	318.77	3,763.04	533.61	7,549.87		2,301.30
15-Aug	102.61	3,865.65	1,491.01	9,040.87	234.89	2,405.65
16-Aug	90.42	3,956.07	3,215.87	12,256.75	104.35	2,599.69
17-Aug	351.96	4,308.03	1,478.92	13,735.66	194.04	2,855.01
18-Aug	135.64	4,443.67	727.80	14,463.46	255.32	3,021.97
19-Aug	238.84	4,682.51	392.22	14,855.68	166.96	3,136.75
20-Aug	312.88	4,995.39	678.26	15,533.94	114.78	3,261.97
21-Aug	481.28	5,476.67	182.66	15,716.60	125.22	3,421.97
22-Aug	616.15	6,092.82	369.23	16,085.84	160.00	3,528.64
23-Aug	383.23	6,476.06	5,533.33	21,619.17	106.67	3,600.13
24-Aug	402.93	6,878.99	1,850.43	23,269.60	71.49	3,681.83
25-Aug	257.65	7,136.64	1,038.96	24,308.56	81.70	3,900.96
26-Aug	668.29	7,804.93	277.90	24,586.46	219.13	3,984.44
27-Aug	170.64	7,975.57	231.07	24,817.53	83.48	4,078.35
28-Aug	557.09	8,532.66	126.13	24,943.66	93.91	4,195.90
29-Aug	578.31	9,110.97	194.33	25,137.99	117.55	4,195.90
30-Aug	122.01	9,232.98	241.28	25,379.27		
31-Aug	209.75	9,442.73	122.26	25,501.53		
01-Sep	696.37	10,139.10	201.40	25,702.92		
02-Sep	514.29	10,653.39	63.58	25,766.50		
03-Sep	288.91	10,942.30	138.02	25,904.52		
04-Sep	220.07	11,162.37	59.97	25,964.49		
05-Sep	165.86	11,328.24	39.85	26,004.34		
06-Sep	0.00	11,328.24	0.00	26,004.34		
07-Sep	86.80	11,415.04	342.86	26,347.19		
08-Sep	171.43	11,586.46	0.00	26,347.19		
09-Sep	248.50	11,832.96	57.55	26,404.75		
10-Sep	79.21	11,912.17				
11-Sep	62.58	11,974.75				
12-Sep	186.05	12,160.80				
13-Sep	258.06	12,418.86				

* The quartiles are indicated by an "*" and the mid-points are indicated by an "**".

* No fishing due to day off, weather or mechanical.

Table 17. 1995 Kotzebue Sound subsistence salmon harvests.

			Chinook		Chum		Pink		Sockeye		Coho		Total	
	Total HH's	HH's Contacted	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total	Reported Harvest	Est.* Total
Ambler	78	68	1	1	7,777	8,558	1	1	5	5	0	0	7,784	8,566
Kiana	101	76	0	0	4,583	5,985	5	7	0	0	0	0	4,588	5,991
Kobuk	27	23	1	1	2,759	2,959	0	0	0	0	0	0	2,760	2,960
Kotzebue***	711	147	29	140	10,484	50,708	108	522	100	484	344	1,664	11,065	53,518
Noorvik	126	103	7	8	13,494	15,485	30	34	1	1	41	47	13,573	15,575
Noatak	92	76	0	0	5,703	6,359	0	0	0	0	100	111	5,803	6,469
Shungnak	53	44	0	0	4,876	5,880	0	0	0	0	0	0	4,876	5,880
Shishmaref****	139	45	25	77	2,249	6,947	484	1,495	144	445	239	738	3,141	9,702
KOTZEBUE SOUND	1,327	582	63	228	51,925	102,880	628	2,059	250	935	724	2,560	63,590	108,662

* If less than 30 or 50% of households in a community were contacted, then reported harvest is used for estimated harvest.

*** Alaska Department of Fish and Game, Division of Subsistence, postcard survey, 1995.

**** Alaska Department of Fish and Game, Division of Subsistence, baseline harvest survey, 1996.

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, household surveys, 1995.

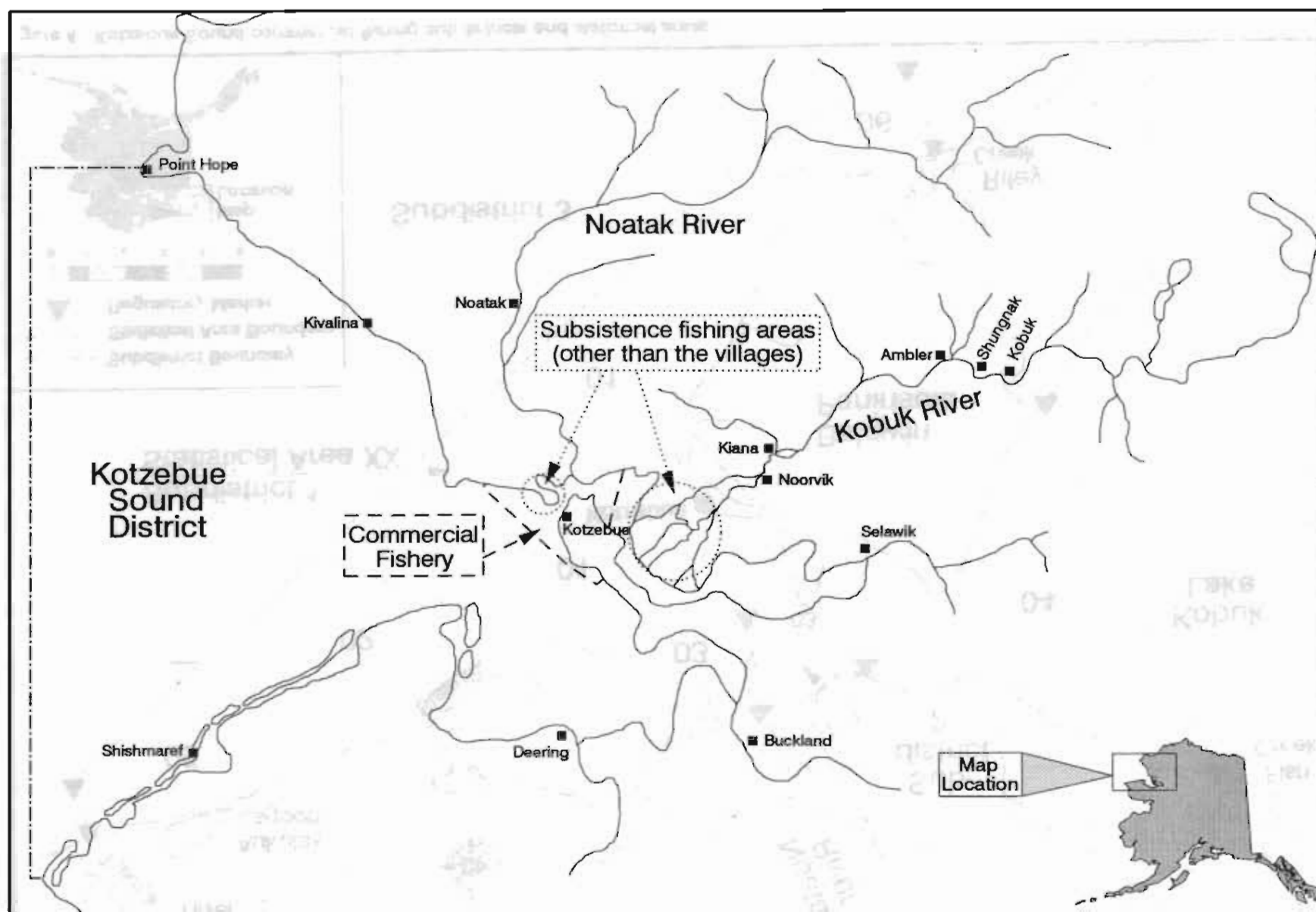


Figure 3. Kotzebue Sound commercial fishing district, villages and subsistence fishing areas.

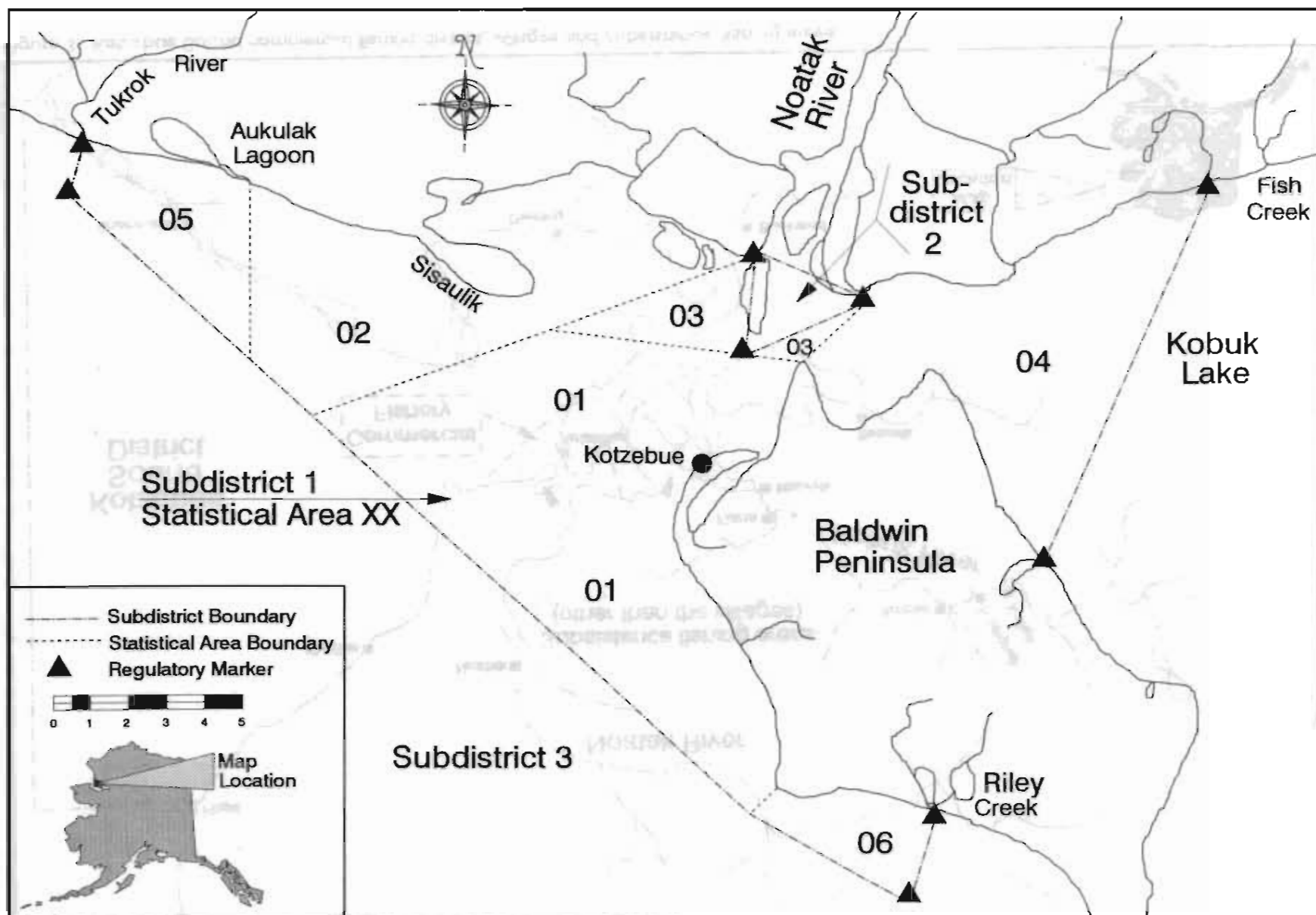


Figure 4. Kotzebue Sound commercial fishing subdistricts and statistical areas.

Kotzebue District

Historical Chum Salmon Commercial Catch

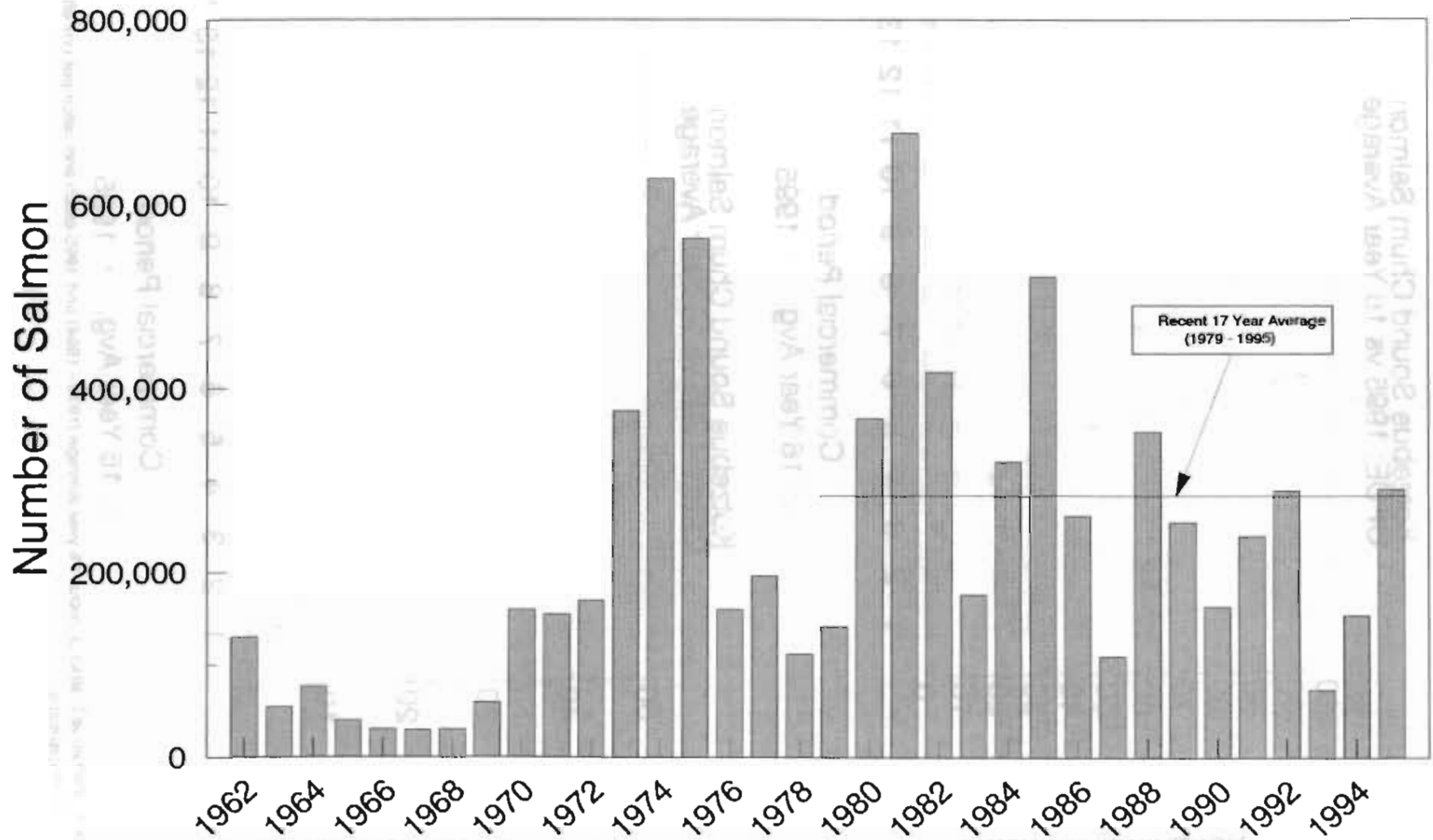
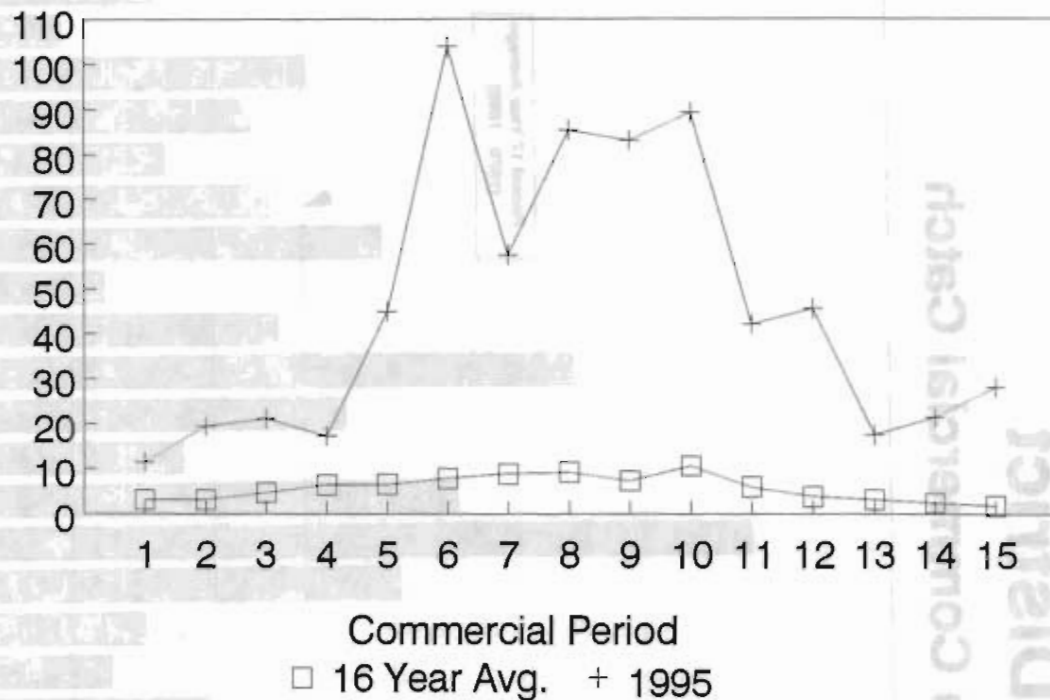


Figure 5. Kotzebue District historical chum salmon commercial catch.

Catch Per Unit Effort

Kotzebue Sound Chum Salmon CPUE: 1995 vs 16 Year Average



Number of Salmon (x 1,000)

Kotzebue Sound Chum Salmon Catch: 1995 vs 16 Year Average

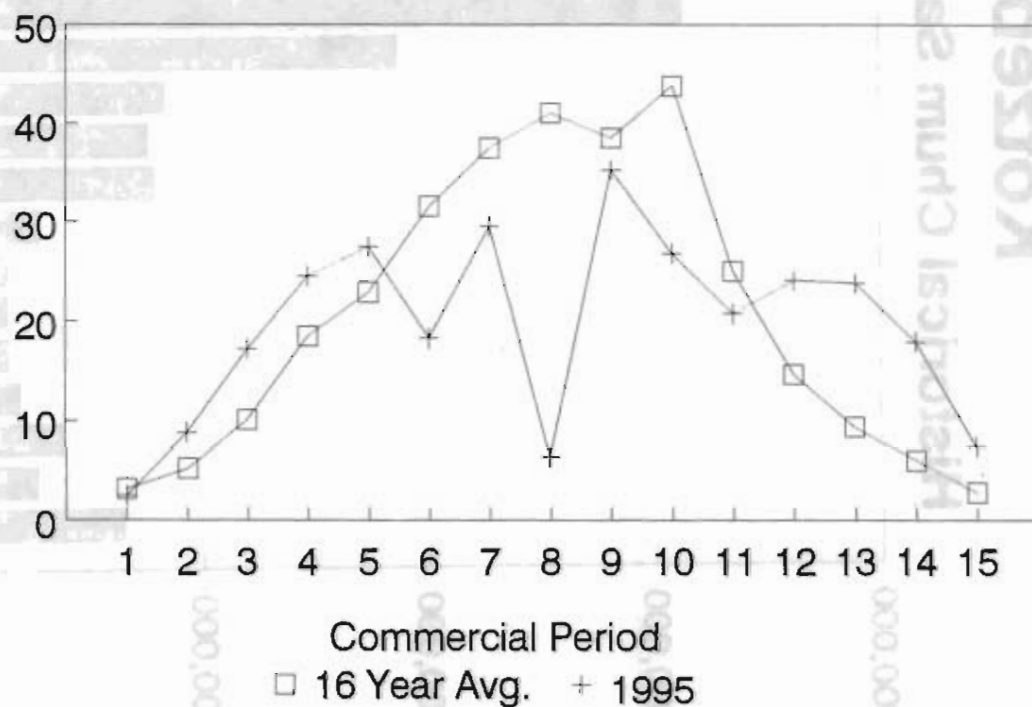


Figure 6. Kotzebue District previous 16 year average (1979–1994) and 1995 catch and catch per unit effort comparisons.

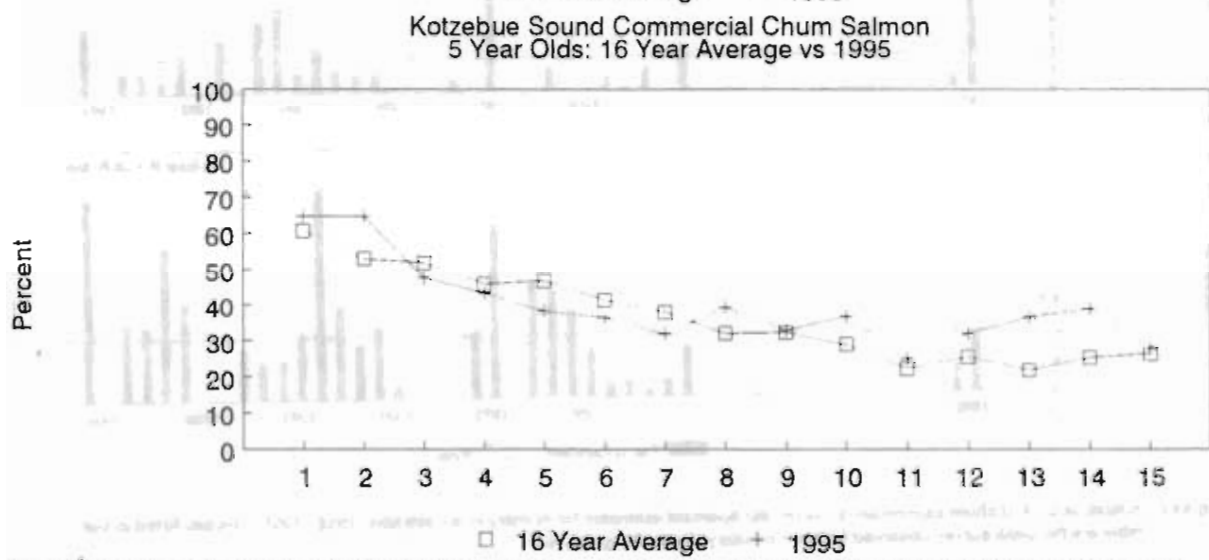
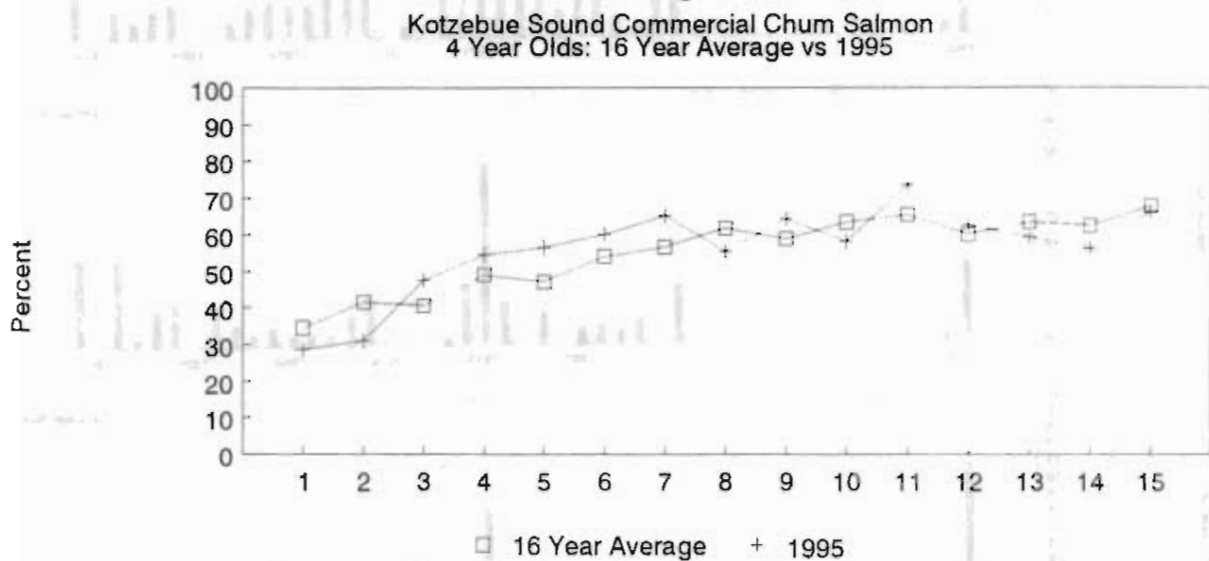
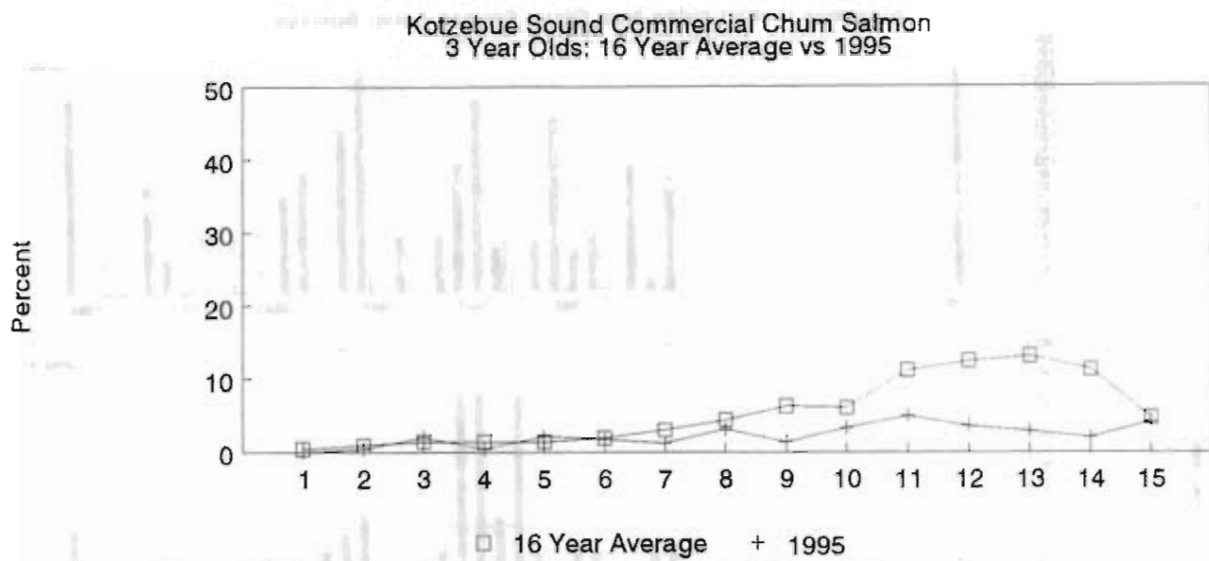


Figure 3. Kotzebue Sound chum salmon age composition by period comparing the recent 16 year average (1979–1994) to 1995.

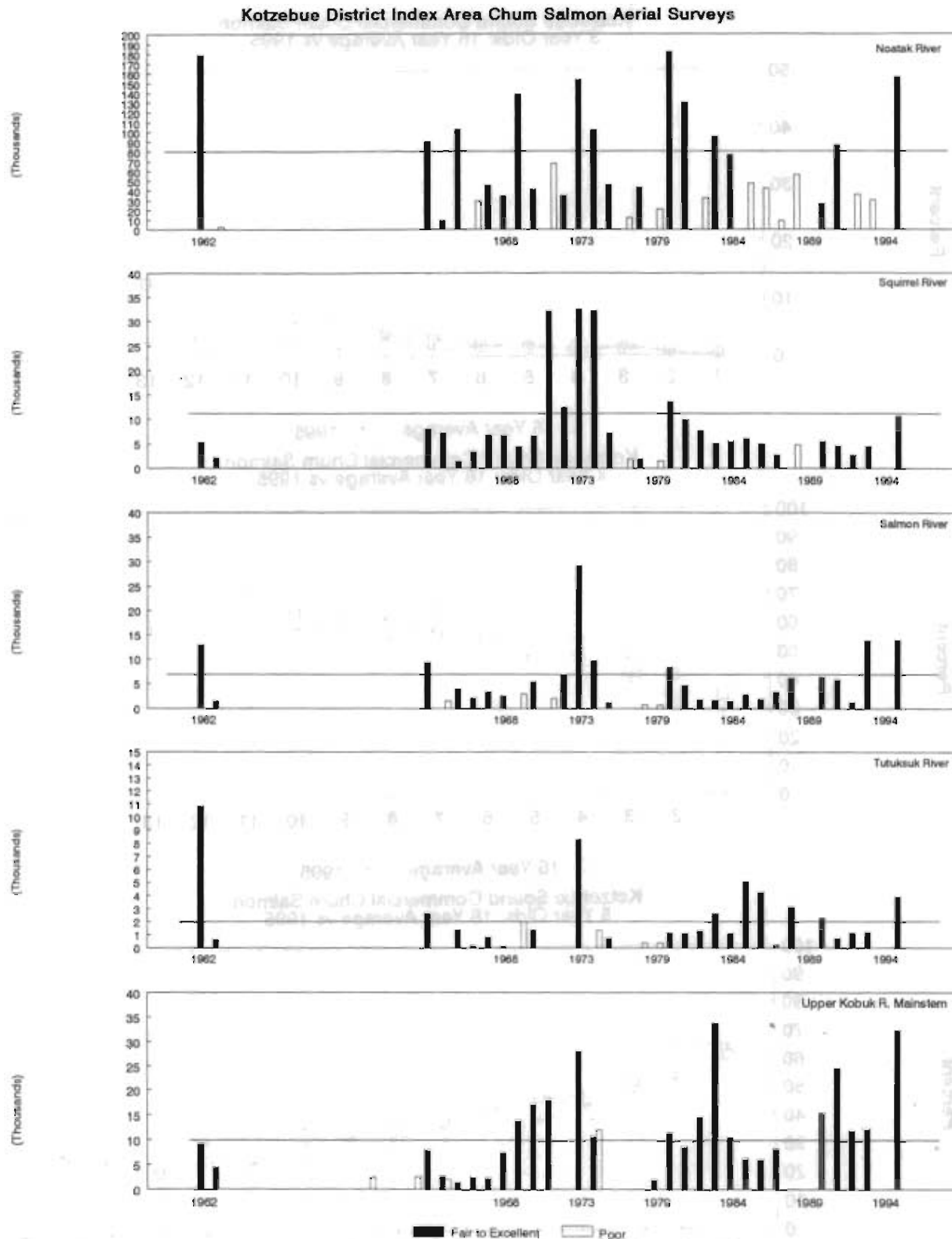


Figure 8. Kotzebue District chum salmon aerial survey escapement estimates for primary index streams, 1962–1995. Indices listed in this table are the peak survey observed for each tributary during the given year.

Kobuk River Drift Test Fish Cumulative CPUE

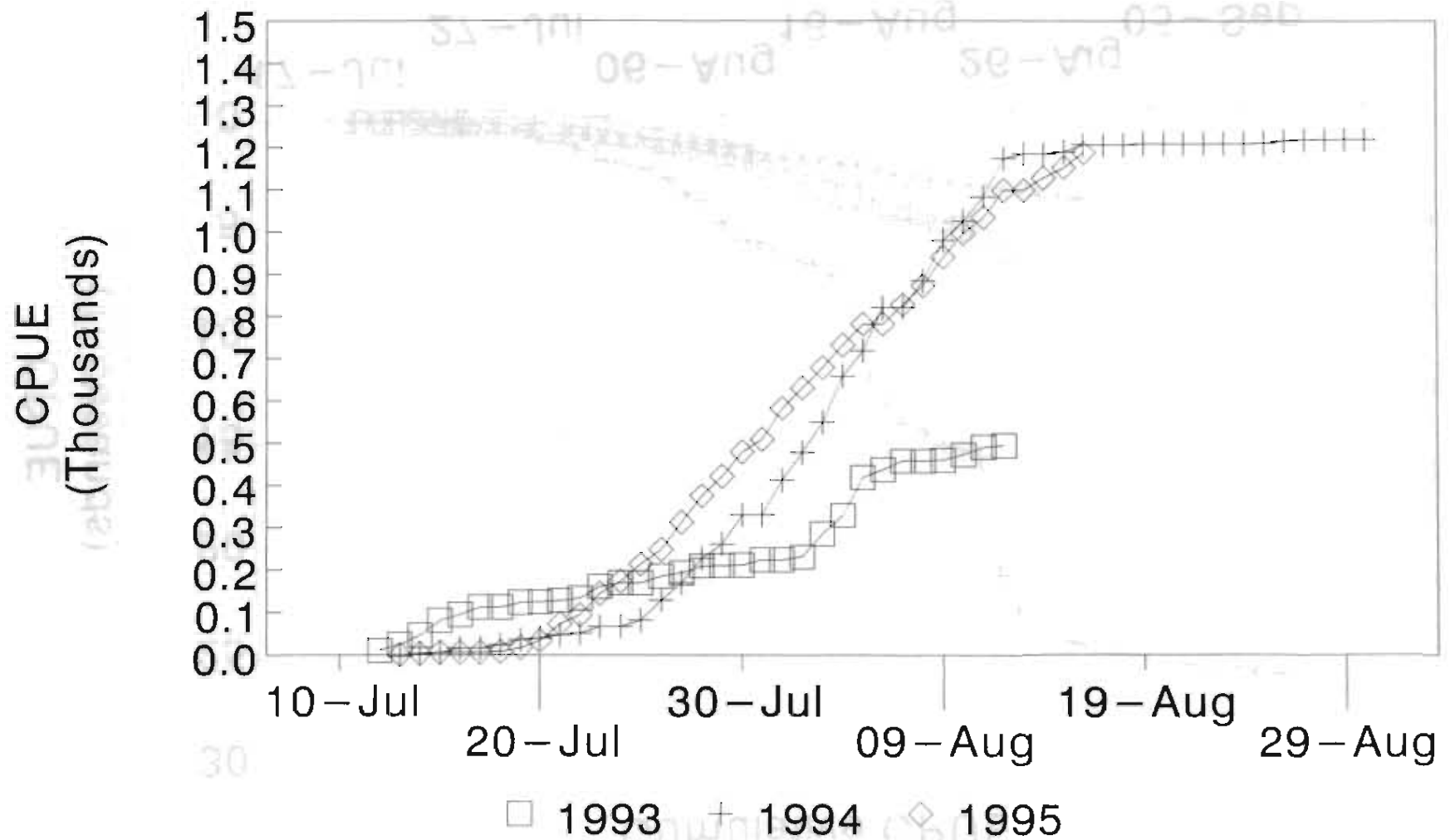


Figure 9. Kobuk River drift test fish cumulative CPUE, 1993–1995.

Noatak River Drift Test Fish Cumulative CPUE

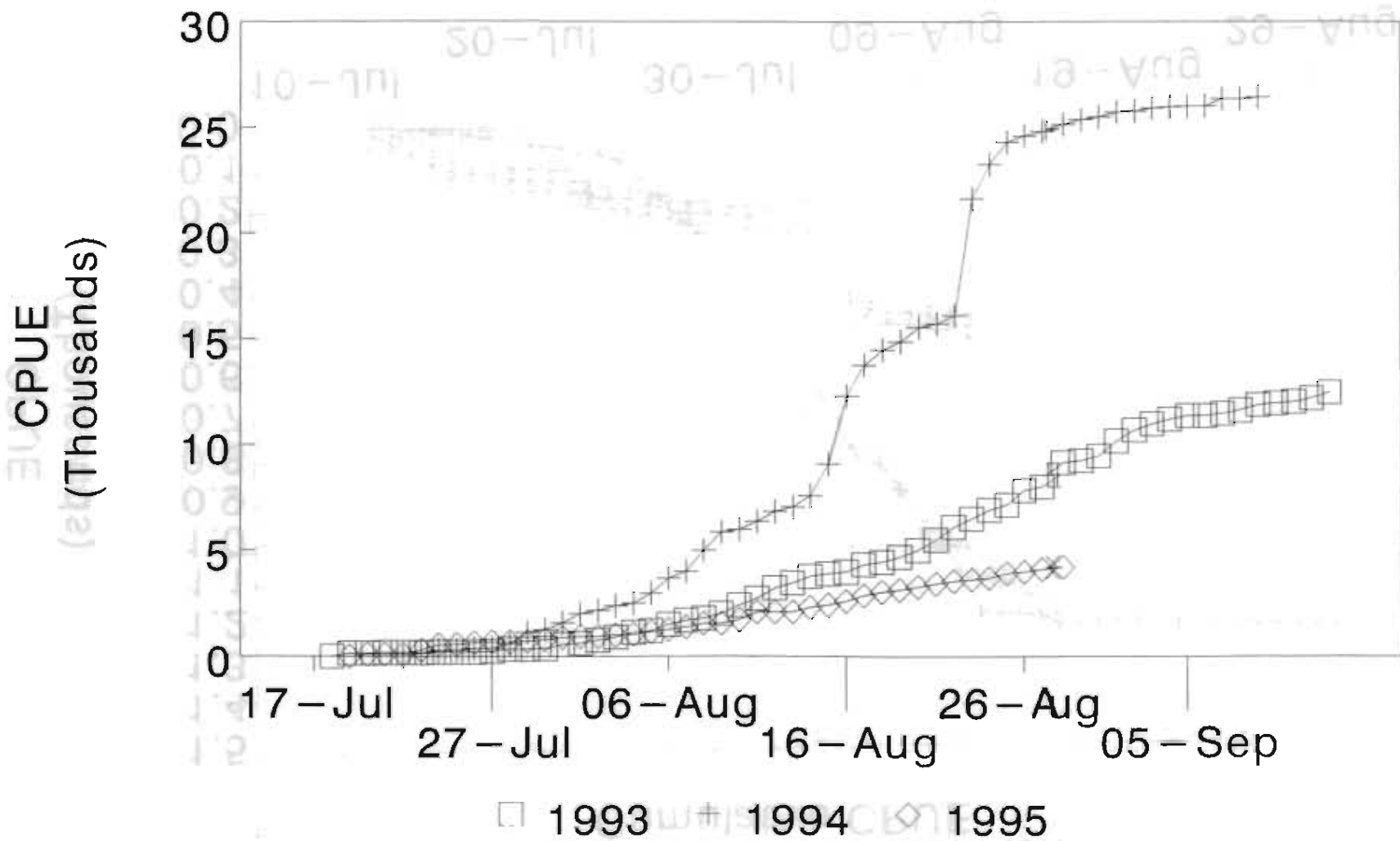


Figure 10. Noatak River chum salmon drift test fish cumulative CPUE for the right bank, 1993–1995.

Appendix Table C.1. Kotzebue District chum salmon commercial catch statistics, 1962–1995.

Year	Total Catch	Total Days ^a	Total Boat Days ^b	Average Catch per Boat Day	Number of Fishermen ^c	Average Seasonal Catch per Fishermen
1962	129,948	21.0	793	164	84	1,547
1963	54,445	20.0	693	79	61	893
1964	76,449	27.0	560	137	52	1,470
1965	40,025	32.0	410	98	45	889
1966	30,764	35.0	548	56	44	699
1967	29,400	33.0	556	53	30	980
1968	30,212	34.0	858	35	59	512
1969	59,335	40.0	798	74	52	1,141
1970	159,664	32.0	1,368	117	82	1,947
1971	154,956	29.0	1,468	106	91	1,703
1972	169,664	35.0	2,095	81	104	1,631
1973	375,432	25.0	2,217	169	148	2,537
1974 ^d	627,912	32.0	3,769	167	185	3,394
1975 ^e	563,345	39.0	4,301	131	267	2,110
1976	159,796	16.0	2,236	71	220	726
1977	195,895	21.0	2,353	83	224	875
1978	111,494	23.0	2,738	41	208	536
1979	141,623	21.0	2,462	58	181	782
1980	367,284	27.0	2,559	144	176	2,087
1981	677,239	27.0	3,336	203	187	3,622
1982	417,790	23.5	3,115	134	199	2,099
1983	175,762	12.5	1,557	113	189	930
1984	320,206	19.5	2,432	132	181	1,769
1985	521,406	25.5	3,376	154	189	2,759
1986	261,436	15.5	2,049	128	187	1,398
1987	109,467	11.5	1,160	94	160	684
1988	352,915	21.5	2,761	128	193	1,829
1989	254,617	22.2	1,961	130	165	1,543
1990	163,263	11.5	1,760	93	153	1,067
1991	239,923	22.5	1,795	134	142	1,690
1992	289,184	17.0	1,513	191	149	1,941
1993 ^f	73,071	7.0	431	170	114	641
1994 ^g	153,452	9.8	426	361	109	1,406
1995	290,730	9.7	282	1,033	92	3,160

^a Day = 24 hours of open fishing time.

^b Boat days standardized in 1983 for all prior years. Boat days = number of boats fishing times period length in hours divided by 24. Total boat days = total season boat hours divided by 24.

^c During 1962–1966 and 1968–1971 figures represent the number of vessels licensed to fish in Kotzebue District, not the number of fishermen.

^d Includes 6,567 chum salmon from the Deering experimental fishery.

^e Includes 10,704 chum salmon from the Deering experimental fishery.

^f Includes 2,000 chum salmon from the Sikusuiq Springs Hatchery terminal fishery.

^g Includes 4,000 chum salmon commercially caught but not sold on July 29.

Appendix Table C.2. Kotzebue District chum salmon type of processing and weights, 1962–1995.

Year	Chum Salmon		Other ^a	Fresh Frozen Salmon Roe (pounds)	Cured Pounds
	Cases (48lbs)	Fresh Frozen (Round weight in pounds)			
1962	14,500				
1963	5,396				
1964	5,421	202,993			
1965	1,929	207,350			
1966		310,716		13,600	3,065
1967		273,420			11,488
1968		288,500			11,850
1969		455,013			8,183
1970		1,240,000			48,377
1971		1,264,753			27,542
1972		1,547,041			55,376
1973		3,416,431			144,768
1974		5,361,130 ^b			
1975		4,877,313 ^c			
1976		1,415,549	487		
1977		1,846,340	1,075		
1978		1,009,121	32,419		
1979		1,236,429	6,155		
1980		3,160,948	7,828		
1981		6,139,518	2,210		
1982		3,833,051	790	100	
1983		1,647,160	2,449		
1984		2,631,582	1,593		
1985		4,528,379	1,106		
1986		2,271,320	1,691		
1987		900,405	597		
1988		3,060,292	2,120		
1989		2,163,174	1,426		
1990		1,453,040	538		
1991		1,951,041	714		
1992		2,397,302	2,714		
1993 ^d		613,968	1,507	1,000	
1994 ^d		1,166,494	73		
1995		2,329,898	93		

^a Chinook and pink salmon.

^b Includes 36,775 pounds from the experimental commercial fishery at Deering.

^c Includes 80,801 pounds from the experimental commercial fishery at Deering.

^d Includes 11,160 pounds from the Sikusuilaq Springs Hatchery terminal fishery.

Pounds of roe stripped are from a verbal report.

^e Includes 31,500 pounds commercially caught but not reported on fish tickets.

Appendix Table C3. Kotzebue District commercial fishery dollar value estimates, 1962–1995.^a

Year	Gross Value of Catch to Fishermen	Wholesale Value of Pack ^b	License and Tax Revenue to State
1962	\$4,500	\$304,500	\$11,635
1963	\$9,140	\$113,316	\$6,040
1964	\$34,660	\$158,020	\$5,279
1965	\$18,000	\$83,294	\$2,952
1966	\$25,000	\$84,630	\$2,820
1967	\$28,700	\$100,450	\$4,245
1968	\$46,000	\$62,000	\$2,800
1969	\$71,000		
1970	\$186,000		\$5,520
1971 ^c	\$200,000		\$5,970
1972 ^d	\$260,000		
1973	\$925,000		
1974	\$1,822,784		\$18,121
1975	\$1,365,648		\$16,955
1976	\$580,375		\$15,364
1977	\$1,033,950		\$19,960
1978	\$575,260		\$9,913 ^e
1979	\$990,263		\$18,302 ^e
1980	\$1,446,633		\$11,820 ^e
1981	\$3,246,793		\$11,220 ^e
1982	\$1,961,518		\$7,085 ^e
1983	\$420,736		\$24,097 ^e
1984	\$1,148,884		\$39,696 ^e
1985	\$2,137,368		\$7,020 ^f
1986	\$931,241		\$7,020 ^f
1987	\$515,000		\$7,110 ^f
1988	\$2,581,333		\$11,790 ^g
1989	\$613,823		\$11,750 ^g
1990	\$438,044		\$11,770 ^g
1991	\$437,948		\$11,820 ^g
1992	\$533,731		\$11,615 ^g
1993 ^h	\$235,061		\$11,795 ^g
1994	\$233,512		\$11,420 ^g
1995	\$316,031		\$11,365 ⁱ

^a Some estimates between 1962 and 1981 include only chum value which in figures represent over 99% of the total value. Figures after 1981 represent the chum value as well as incidental species such as char, whitefish and other salmon.

^b Based on type of processing when fish were shipped out of the district.

^c Includes \$9,193 from the experimental commercial fishery at Deering.

^d Includes \$17,776 from the experimental commercial fishery at Deering.

^e Includes permit and vessel fees only.

^f Information not available.

^g Includes permit renewal fees only; vessels were not required.

^h Includes \$3,648 from the Sikusuilaq Springs Hatchery terminal fishery.

ⁱ As of November 2, 1995, 38 permit holders had not paid dues for 1995.

Appendix Table C.4. Kotzebue District mean prices paid per pound to salmon fishermen by species, 1962 – 1995 ^a

Year	Chum Salmon		Chinook Salmon	Pink Salmon	Inconnu	Dolly Varden
	Average Weight	Average Price				
1962		\$0.35 ^c				
1963		\$0.35 ^c				
1964	8.3	\$0.45 ^c				
1965	9.0	\$0.45			\$1.30 ^c	
1966	10.1	\$0.11			\$1.40 ^c	\$0.55
1967	9.3	\$0.11			\$1.50 ^c	\$0.75
1968	9.7	\$0.14			\$0.91 ^c	\$0.98
1969	7.5	\$0.15			\$1.30 ^c	\$2.84
1970	8.1	\$0.15				
1971	8.1	\$0.16			\$0.16	\$0.17
1972	9.1	\$0.17			\$0.20	\$0.17
1973	9.1	\$0.25			\$0.30	\$0.16
1974 ^b	8.5	\$0.34			\$0.30	\$0.16
1975 ^b	8.6	\$0.28			\$0.30	\$0.30
1976	8.9	\$0.41			\$0.30	\$0.30
1977	9.6	\$0.56			\$0.30	
1978	9.1	\$0.57			\$0.30	\$0.25
1979	8.8	\$0.80				\$0.25
1980	8.6	\$0.46			\$0.10	\$0.20
1981	9.1	\$0.53			\$0.75	\$0.17
1982	9.3	\$0.51	\$1.25	\$0.15	\$0.75	\$0.20
1983	9.4	\$0.25	\$1.08	\$0.13		\$0.20
1984	8.2	\$0.44	\$1.03			\$0.25
1985	8.7	\$0.47	\$1.25			\$0.25
1986	8.7	\$0.41	\$1.25			\$0.20
1987	8.2	\$0.57	\$1.25			\$0.30
1988	8.7	\$0.85	\$1.98			\$0.35
1989	8.5	\$0.28	\$1.72			\$0.28
1990	8.9	\$0.31	\$2.00			\$0.25
1991	8.1	\$0.22	\$1.64		\$0.50	\$0.18
1992	8.3	\$0.22	\$1.89		\$0.58	\$0.10
1993	8.5	\$0.38	\$2.37		\$0.50	\$0.10
1994	7.8	\$0.20	\$1.14			\$0.17
1995	8.0	\$0.13	\$1.00		\$0.50	\$0.20

^a Information not available for some species in some years.

^b Includes price paid to fishermen of Deering during the experimental commercial fishery.

^c Price per fish.

Appendix Table C.5. Kotzebue District commercial and subsistence salmon catches, 1914-1995.

Year ^a	Commercial Catch			Subsistence Chum Catch			
	Chum ^b	Other ^c	Total	Chum	Number of Fishermen Interview	Average Catch per Fishermen	Total Documented Catch
1914	8,550		8,550				
1915	4,750		4,750				
1916	19,000		19,000				
1917	44,612		44,612				
1918	27,407		27,407				
1957			298,430 ^d				
1962	129,948	27	129,975	70,283	81	868	200,258
1963	54,445	143	54,588	31,069	67	464	85,657
1964	76,499	5	76,504	29,762	58	513	106,266
1965	40,034		40,034	30,500	89	343	70,534
1966	30,764	1	30,765	35,588	121	294	66,353
1967	29,400		29,400	40,108	135	297	69,508
1968	30,384		30,384	20,814	65	320	51,198
1969	59,335	48	59,383	29,812	99	301	89,195
1970	159,664		159,664	28,486	164	174	188,150
1971	154,956	1	154,957	23,959	152	158	178,916
1972	169,664	3	169,667	11,085	96	115	180,752
1973	375,432	5	375,437	18,942	101	188	394,379
1974	634,479 ^e	48	634,527	26,729	88	304	661,256
1975	563,682 ^f	36	563,718	27,605	95	291	591,323
1976	159,796	2	159,798	15,765	91	173	175,563
1977	195,895		195,895	9,752	83	117	205,647
1978	111,494	7,007	118,501	12,864	85	151	131,365
1979	141,623	910	142,533	14,605	97	151	157,138
1980	367,284	1,654	368,938	10,945	111	99	379,883
1981	677,239	237	677,476	17,766	71	250	695,242
1982	417,790	57	417,847	30,133	204	148	447,980
1983	175,762	229	175,991	8,262 ^g	46	180	184,253
1984	320,206	107	320,313	15,508 ^h	66	235	335,821
1985	521,406	63	521,469	13,494 ⁱ	243	56	534,963
1986	261,436	106	261,542	36,311	837	43	297,853
1987	109,467	44	109,511	j	j	j	109,511
1988	352,915	152	353,067	j	j	j	353,067
1989	254,617	87	254,704	j	j	j	254,704
1990	163,263	32	163,295	j	j	j	163,295
1991	239,923	44	239,967	j	j	j	239,967
1992	289,184	204	289,388	j	j	j	289,388
1993	73,071 ^j	131	73,202	j	j	j	73,202
1994	153,452 ^k	3	153,455	j	j	j	153,455
1995	290,730	5	290,735	51,925	582	78	342,660
1979-94							
Average	282,415	254	282,669				

^a There was no commercial fishing during 1919-1961.

^b Catches for 1914-1918 are from pack data only. Number of chum salmon estimate at 9.5 per case (#48) and 34 per barrel.

^c Includes pink, chinook, and sockeye salmon.

^d Estimated mean annual catches prior to 1957 (study by Raleigh).

^e Corrected from 1968 annual report due to addition of late catches.

^f Includes 6,567 chum salmon from the Deering experimental fishery.

^g Includes 10,704 chum salmon from the Deering experimental fishery.

^h Partial survey.

ⁱ Does not include harvest from the villages of Noetak and Kivalina.

^j Not surveyed.

^k Includes 2,000 chum salmon from the Sikusuiq Springs Hatchery terminal fishery.

^l Includes 4,000 chum salmon commercially harvested on July 29 but not sold.

Appendix Table C.6. Kotzebue District subsistence chum salmon catches by village, 1962-1995.

Year	Village					Kobuk River	Noatak Village	Village						District Total
	Noorvik	Kiana	Ambler	Shungnak	Kobuk			Kotzebue	Deering	Kivalina	Buckland	Candle	Shishmaref	
1962	15,934	3,139			2,321	21,394	48,890							70,284
1963	4,304	1,973	755	1,240	200	8,472	16,762	5,835						31,069
1964	2,167	783	2,142	3,134	1,020	9,246	12,763	7,753						29,762
1965	5,596	1,598	1,340	2,160	877	11,571	5,671	8,058	5,200					30,500
1966	3,141	433	912	899	625	6,010	19,700	3,640	6,238					35,588
1967	2,350	1,489	679	1,500	175	6,193	26,512	4,032	3,098		162	11	100	40,108
1968	2,424	2,488	457	1,600	1,030	7,999	5,490	4,324	2,838		37	89	37	20,814
1969	1,301	2,458	3,525	2,550	1,655	11,489	14,458	1,768	1,897			200		29,812
1970	6,077	3,457	2,899	3,450	600	16,483	4,120	6,814	1,242		344	113		29,116
1971	7,144	5,177	2,299	2,653	1,931	19,204	9,919	1,737	763		155	50	131	31,959
1972	1,744	1,435	1,469	2,665	2,119	9,432	741	1,151	369		59	113	29	11,894
1973	2,312	4,470	1,529	4,406	1,917	14,634	216	1,172	1,098		1,722	50	100	18,992
1974	6,809	2,726	1,651	6,243	2,251	19,680	4,330		1,880		639	15	200	26,744
1975	4,620	4,320	3,390	9,060	1,755	23,145	1,515		1,175		1,540		230	27,605
1976	1,555	1,579	2,000	4,213	562	9,909	4,448		1,358					15,715
1977	891	766	385	1,760	325	4,127	2,125		3,500					9,752
1978	2,034	1,493	2,224	4,766	852	11,369	1,495					50		12,914
1979	2,155	1,225	2,400	2,947	651	9,378	2,227		2,000		1,000			14,605
1980	2,229	2,551	660	2,704	350	8,494	2,135							10,629
1981	3,488	1,439	782	2,800	950	9,459	5,465	2,387	295	110	50			17,766
1982	7,433	4,918	2,506	4,191	600	19,648	5,479	4,099	807	210				30,243
1983	277	223	1,062	3,556	368	5,486	4,035	347	219	200				10,287
1984			2,990	4,241		7,231	6,049	88	1,940	200				15,508
1985	7,015	3,494	3,487	3,115	300	17,411		13,494	573					31,478
1986	8,418			4,483		12,901	1,246	36,311						50,458
1987	5,092			1,975		7,067	2,921							9,988
1988	7,500			6,223		13,723								13,723
1989				3,894		3,894	1,595							5,489
1990	4,353					4,353	3,915							8,268
1991	6,855			4,248		11,103	3,637							14,740
1992	8,370			3,890		12,260	2,043							14,303
1993	8,430			3,730		12,160	3,270							15,430
1994	8,157	1,891	2,860	7,982	5,722	26,612	6,126		3,488					36,226
1995	15,485	5,985	8,558	5,880	2,959	38,867	6,359	50,708						95,934

• No household survey, information is from return of mail questionnaires.

• Not surveyed.

• Does not include 310 chum salmon taken in Selawik.

• Household surveys were conducted in Noatak, Kivalina, and Shungnak only. Other harvest information is from limited return of mail-in calendars.

• Household surveys were conducted in Noatak, Kivalina, Ambler, and Deering. Other harvest information is from limited return of mail-in questionnaires.

• Estimated expanded harvest based on door-to-door interviews conducted by Division of Subsistence.

Appendix Table C.7. Kotzebue District mean subsistence chum salmon catch per fishermen by village, 1962-1995.

Year	Kotzebue	Noatak	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Deering
1962	^a	1,190	665	350	^a	^a	335	^a
1963	650	800	160	^b	94	^b	67	^a
1964	515	710	220	260	310	^a	205	^a
1965	400	810	220	265	190	220	145	^a
1966	158	820	137	62	76	45	104	^a
1967	202	914	90	68	49	125	35	^a
1968	135	220	84	96	33	114	206	^a
1969	98	760	163	223	235	318	206	^a
1970	187	242	132	138	242	182	150	^a
1971	53	148	223	207	177	133	386	^a
1972	63	74	84	84	244	266	302	^a
1973	195	36	121	178	305	489	273	^a
1974	^a	393	324	181	165	891	450	^a
1975	^a	138	210	288	282	647	293	^a
1976	^a	212	259	79	250	281	70	^a
1977	^a	425	56	38	55	104	41	^a
1978	^a	79	88	71	131	265	142	^a
1979	^a	114	98	68	160	184	108	^a
1980	^a	164	318	213	132	246	88	^a
1981	213	579	388	131	129	233	317	^a
1982	84	189	323	246	167	262	200	81
1983 ^c	50	269	139	223	531	254	368	44
1984	44	173	^a	^a	214	303	^a	194
1985	107	^a	206	116	152	195	50	72
1986	47	69 ^d	271	^a	^a	195	^a	^a
1987	^a	225 ^d	189	^a	^a	329	^a	^a
1988	^a	^a	300	^a	^a	389	^a	^a
1989	^a	133	^a	^a	^a	216	^a	^a
1990	^a	135	198	^a	^a	^a	^a	^a
1991	^a	145	311	^a	^a	283	^a	^a
1992	^a	89	310	^a	^a	243	^a	^a
1993	^a	136	312	^a	^a	196	^a	^a
1994 ^e	^a	90	133	32	99	154	260	92
1995 ^e	147	76	103	76	68	44	23	^a

^a Not Surveyed.

^b Number of fishermen not known.

^c Means based on very limited number of mail-in calendars except for the villages of Noatak and Shungnak where interviews were conducted.

^d Partial harvest, fishermen were just beginning to fish.

^e Estimated information based on interviews conducted by Division of Subsistence.

Appendix Table C.8. Chum salmon aerial survey counts for the Kotzebue District, 1962–1995 ^{a,h}. (p. 1 of 4)

Stream	1962	1963	1964	1965	1966	1967	1968	1969
Noatak Drainage								
Noatak River below Kelly River	168,000 ^d	1,970 ^h	89,798	6,152 ^h	101,640	29,120 ^b	39,394	33,945
Eli River	9,080 ^d	35			120		5,502 ^f	68 ^f
Kelly River & Lake	1,818 ^d	600		3,155	570	225	375	150
Noatak River System Total	178,898	2,605	89,798	9,307	102,330	29,345	45,271	34,163
Kobuk Drainage								
Kobuk to Pah River		400		1,750	266		530	
Pah River to just below Selby River		1,530		500			50	
Selby River mouth & Slough		1,045		500	630	1,625	70	
Selby R. mouth to just below Beaver C.		1,095				75	170	
Beaver Creek mouth					460	795	1,550	
Above Beaver Creek		465			118			
Upper Kobuk River Total	9,224 ^d	4,535	7,985 ^e	2,750	1,474	2,495	2,370	7,500 ^e
Squirrel River	5,834 ^d	2,200	8,009	7,230	1,350	3,332	6,746	6,714
Salmon River	12,936 ^d	1,535	9,353	1,500 ^b	3,957	2,116	3,367	2,561
Tutuksuk River	10,841 ^d	670	2,685		1,383	169	823 ^b	159
Kobuk River System Total	38,835 ^e	8,940	28,032	11,480	8,164	8,112 ^e	13,306	16,934

^a Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

^b Poor survey conditions or incomplete, early or late survey.

^c Survey by foot or boat.

^d These fish are unidentified salmon, mostly chums.

^e This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.

^f Unresolvable discrepancies in historical data put this figure in question.

^h Unclear where these fish were observed.

^h The figures in this table have been corrected and supercede figures in previous reports.

ⁱ Surveyed well before peak of migration.

^j Unacceptable conditions.

Appendix Table C.8. (p. 2 of 4)

Stream	1970	1971	1972 ^b	1973 ^b	1974	1975	1976	1977 ^b	1978	1979
Noatak Drainage										
Noatak River below Kelly River	138,145	41,056	64,315	32,144	129,640	96,509	44,574	11,221	37,817	15,721 ^b
Eli River			3,286		22,249	1,302	1,205	742	5,525	1,794
Kelly River & Lake				2,590 ^f	1,381 ^f	3,937	217 ^b	290 ^b	168 ^b	3,200 ^b
Noatak River System Total	138,145	41,056	64,315 ^b	34,734	153,270	101,748	45,996	12,253 ^b	43,510	20,715
Kobuk Drainage										
Kobuk to Pah River	1,753	4,953			2,255	1,873	485		269	75
Pah River to just below Selby River	1,120	2,039	1,865		4,710	3,968	2,037	2,513	1,448	183
Selby River mouth & Slough	4,820	3,490	7,400		7,380				211	1,110
Selby R. mouth to just below Beaver C.	2,385	4,720	3,170	920	13,775 ^c	4,861 ^d			53	640
Beaver Creek mouth	4,930	2,000	3,000	850						
Above Beaver Creek			2,720	700						
Upper Kobuk River Total	13,908	17,202	18,155	2,470 ^b	28,120	10,702	2,522 ^b		1,981 ^b	2,008
Squirrel River	4,418	6,628	32,126	12,345	32,523	32,256	7,229	1,964 ^b	1,863 ^b	1,500 ^b
Salmon River	3,000 ^b	5,453	2,073 ^b	6,891	29,190	9,721	1,161		814 ^b	674 ^b
Tutuksuk River	2,000 ^b	1,384 ^f			8,312	1,344 ^b	758		368 ^b	382 ^b
Kobuk River System Total	23,326	30,667	52,354	21,706	98,145	54,023	11,670	1,964	5,026	4,564

^a Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

^b Poor survey conditions or incomplete, early or late survey.

^c Survey by foot or boat.

^d These fish are unidentified salmon, mostly chums.

^e This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.

^f Unresolvable discrepancies in historical data put this figure in question.

^g Unclear where these fish were observed.

^h The figures in this table have been corrected and supercede figures in previous reports.

ⁱ Surveyed well before peak of migration.

^j Unacceptable conditions.

Appendix Table C.8. (p. 3 of 4)

Stream	1980	1981 ^b	1982 ^b	1983	1984	1985 ^b	1986 ^b	1987 ^b	1988 ^b	1989 ⁱ
Noatak Drainage										
Noatak River below Kelly River	164,474	116,352	20,682	79,773	67,873	45,525	37,227	5,515 ^{kj}	45,930 ^{kj}	
Eli River	10,277		189	3,044	5,027	855	4,308	2,780	8,639	
Kelly River & Lake	7,418	13,770	11,604	12,137	3,499	1,200	839	950	1,460	
Noatak River System Total	182,167	130,122	32,475	94,954	76,399	47,580	42,374	9,245	56,029	
Kobuk Drainage										
Kobuk to Pah River	1,694	18	2,643 ^b	2,147	402	2,048 ⁱ	531			
Pah River to just below Selby River	2,069	309	598 ^b	2,433	257	241 ⁱ	511	2,250	1,135 ^b	
Selby River mouth & Slough		8,321 ^{de}	2,454	11,683		711 ⁱ	673	1,470	820 ^b	
Selby R. mouth to just below Beaver C.	6,925 ^d		7,268	13,011	5,910	3,278 ⁱ	3,282	1,350	6,890 ^b	
Beaver Creek mouth	784		1,711	3,059						
Above Beaver Creek				1,413	4,052		1,018	3,140	3,050 ^b	
Upper Kobuk River Total	11,472	8,648	14,674	33,746	10,621	6,278	6,015	8,210	11,895 ^b	
Squirrel River	13,563	9,854	7,690	5,115	5,473	6,160	4,982	2,708 ^c	4,848 ^h	
Salmon River	8,456	4,709	1,821 ^f	1,677	1,471	2,884	1,971	3,333	6,208	
Tutuksuk River	1,165	1,114	1,322	2,637	1,132	5,098	4,257	206	3,122	
Kobuk River System Total	34,656	24,325	25,507	43,175	18,697	20,420	17,225	14,457	26,073	

^a Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

^b Poor survey conditions or incomplete, early or late survey.

^c Survey by foot or boat.

^d These fish are unidentified salmon, mostly chums.

^e This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.

^f Unresolvable discrepancies in historical data put this figure in question.

^g Unclear where these fish were observed.

^h The figures in this table have been corrected and supercede figures in previous reports.

ⁱ Surveyed well before peak of migration.

^j Unacceptable conditions.

Appendix Table C.8. (p. 4 of 4)

Stream	1990 ^b	1991	1992 ^b	1993	1994 ⁱ	1995	Aerial Escapement Goals
Noatak Drainage							
Noatak River below Kelly River	23,345 ^b	82,750	34,335	25,415		147,260	
Eli River	3,000	2,940	701	4,795		7,860	
Kelly River & Lake	325 ⁱ	654	726	9		8,364	
Noatak River System Total	26,670	86,344	35,762	30,219		163,504	84,000
Kobuk Drainage							
Kobuk to Pah River	4,610	9,840	1,030	3,896		12,190	
Pah River to just below Selby River	305	2,780	3,820	1,535		4,537	
Selby River mouth & Slough		1,040	1,500	1,800		1,250	
Selby River	420	1,460	868	824		3,364	
Selby R. mouth to just below Beaver C.	7,505	5,250	3,845	929		10,898	
Beaver Creek mouth							
Above Beaver Creek	2,515	4,155	740	3,174		3,486	
Upper Kobuk River Total	15,355	24,525	11,803	12,158		35,725	10,000
Squirrel River	5,500	4,606	2,765	4,463		10,605	11,500
Salmon River	6,335	5,845	1,345	13,880		13,988	7,000
Tutuksuk River	2,275	744	1,162	1,196		3,901	2,000
Kobuk River System Total	29,465	35,720	17,075	31,697		64,219	30,500

^a Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

^b Poor survey conditions or incomplete, early or late survey.

^c Survey by foot or boat.

^d These fish are unidentified salmon, mostly chums.

^e This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.

^f Unresolvable discrepancies in historical data put this figure in question.

^g Unclear where these fish were observed.

^h The figures in this table have been corrected and supercede figures in previous reports.

ⁱ Surveyed well before peak of migration.

^j Unacceptable conditions.

Appendix Table C.9. Kotzebue District commercial age and sex composition of chum salmon, 1962–1995.^a

Year	Sample Size	Percent		Percent Age Class			
		Males	Females	Age-3	Age-4	Age-5	Age-6
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	52.9	45.0	1.7	0.4
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	1,865	37.3	62.7	8.8	72.2	18.5	0.5
1968	1,989	48.2	51.8	21.2	58.1	19.8	0.9
1969	1,125	53.7	46.3	36.8	58.3	4.9	0.0
1970	267	45.3	54.7	3.9	91.0	5.1	0.0
1971	1,105	54.6	45.4	7.1	66.8	26.1	0.0
1972	980	50.9	49.1	15.8	59.5	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	53.6	2.5	86.8	10.7	0.0
1976	566	47.9	52.1	11.2	51.5	37.2	0.1
1977	446	49.3	50.7	6.7	73.0	18.6	1.7
1978	579	49.9	50.1	10.5	57.5	31.8	0.2
1979 ^b	658	53.3	46.7	30.6	53.2	15.2	1.0
1980 ^c	710	56.4	43.6	15.1	78.1	6.6	0.2
1981 ^d	1,167	52.4	47.6	2.4	67.1	30.5	0.0
1982	983	48.8	51.2	5.9	48.3	40.3	5.5
1983 ^e	1,979	43.4	56.6	5.8	57.7	34.2	2.3
1984 ^f	2,933	50.2	49.8	14.6	64.4	19.7	1.3
1985 ^g	3,293	47.8	52.2	0.4	83.7	15.5	0.4
1986 ^h	3,095	46.0	54.0	0.3	18.6	78.9	2.2
1987 ⁱ	1,987	52.0	48.0	15.0	43.0	31.0	11.0
1988 ^j	3,324	48.0	52.0	6.5	74.9	16.9	1.7
1989	3,336	49.3	50.7	0.7	77.9	20.4	1.0
1990 ^k	2,497	49.4	50.6	2.3	45.6	50.7	1.4
1991	3,292	46.4	53.6	2.9	60.4	35.8	0.9
1992 ^l	3,706	39.9	60.1	0.9	58.5	37.5	3.1
1993 ^m	3,707	50.9	49.1	2.9	26.4	66.5	4.2
1994 ⁿ	3,744	44.8	55.2	3.3	63.0	30.8	2.9
16 Year Average (1979–1994)		47.6	52.4	4.7	57.2	35.7	2.4
1995	4,621	50.9	49.1	2.3	59.8	36.0	1.9

^a Commercial periods not sampled for years 1962 to 1978 are unknown.

^b Commercial openings 1 and 10 not sampled due to period closure.

^c Commercial openings 8, 13, and 15 not sampled due to period closure.

^d Commercial openings 8, 10, 12, and 14 not sampled due to period closure.

^e Commercial openings 11, 13, 14, and 15 not sampled due to period closure.

^f Commercial openings 14 and 15 not sampled due to period closure.

^g Commercial openings 1, 3, 5, 7, 9, 11, and 13 not sampled due to period closure.

^h Commercial opening 15 not sampled due to period closure.

ⁱ Commercial openings 1, 2, 4, 6, 7, 8, 10, 11, 14, and 15 not sampled due to period closure.

^j Includes 0.1 percent age-7 fish.

^k Commercial openings 11 to 15 not sampled due to period closure.

^l Commercial opening 12 not sampled due to period closure.

^m Commercial openings 6, 8, 10, 11, 12, 13, 14, and 15 were closed periods. Closed periods were sampled for age and sex composition from commercial test nets and are included in the 1993 data.

ⁿ Commercial openings 14 and 15 were closed periods. Closed periods were sampled for age and sex composition from commercial test nets and are included in the 1994 data.

SPawning Areas and Timing

INTRODUCTION

The Norton Sound District consists of all waters of Alaska between the latitude of the latitude of the westernmost point of Cape Prince of Wales and the latitude of Point Barrow and the latitude of Point Barrow. The Kotzebue District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Barrow. The Port Clarence District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Barrow. The Kotzebue District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Barrow. The Port Clarence District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Barrow.

Section 2: PACIFIC HERRING

(Includes Norton Sound and Port Clarence/Kotzebue Districts)

The arrival of Pacific herring on the spawning grounds is greatly influenced by climate and occurs in a highly irregular manner. The extent and distribution of the herring sea ice pack. Most herring spawning populations begin in the eastern Bering Sea coast immediately after ice breakup between in May and mid-June. Spawning progresses in a southerly direction and may continue into July or August. Spawning of the herring is in the Bering Sea.

The primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. When sea ice has formed in this area late, spawning has been more extensive along Cape Umanak and across the northern shore of Norton Sound between Fair Head and Cape Umanak. Spawning areas have been more difficult to identify due to small herring stock and limited investigations. Likely spawning areas include Imukuk Strait, Shishmaref, and Cape Umanak and Fair Head.

NORTON SOUND DISTRICT

Spawning Areas and Timing

Spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. When sea ice has formed in this area late, spawning has been more extensive along Cape Umanak and across the northern shore of Norton Sound between Fair Head and Cape Umanak. Spawning areas have been more difficult to identify due to small herring stock and limited investigations. Likely spawning areas include Imukuk Strait, Shishmaref, and Cape Umanak and Fair Head.

SECTION 2 - PACIFIC HERRING

INTRODUCTION

Boundaries

The Norton Sound District consists of all waters of Alaska between the latitude of the western most tip of Cape Douglas and the latitude of Canal Point Light (Figures 8 and 9). The Port Clarence District consists of all waters of Alaska between the latitude of Cape Douglas and the latitude of Cape Prince of Wales. The Kotzebue District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Hope (Figure 8).

Spawning Areas and Timing

The arrival of Pacific herring on the spawning grounds is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring spawning populations appear near the eastern Bering Sea coast immediately after ice breakup between mid-May and mid-June. Spawning progresses in a northerly direction and may continue into July or August along portions of the Seward Peninsula or within the Chukchi Sea.

The primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. When sea ice has remained in this area into June, spawning has been more extensive along Cape Denbigh and several locations along the northern shore of Norton Sound between Bald Head and Bluff. More northerly spawning areas have been more difficult to identify due to small herring stock sizes and limited investigations. Likely spawning areas include Imuruk Basin, Shishmaref, Deering-Kiwalik, and Hotham Inlet.

NORTON SOUND DISTRICT

Fishing History

Pacific herring (*Clupea harengus pallasii*) have been utilized for subsistence purposes by coastal residents prior to the mid-1800's when their use was first documented by early explorers. The earliest American commercial effort on Bering Sea herring apparently took place in the early part of this century at Golovin Bay in Norton Sound (Appendix Table D1).

Food Herring

Early records indicate that about 3,200 short tons of "fall herring" were processed in Norton Sound from 1916 to 1941 (Appendix Table D1). This fishery was dependent on salt curing and declined because of poor marketing conditions arising from foreign competition. The Japanese began gillnetting in Norton Sound during 1968 with three vessels. Effort was concentrated about 12 miles offshore between St. Michael and Golovin. Approximately 40 Japanese vessels reported harvesting a record 1,400 short tons (st) of herring during 1969 (Appendix Table D2). An average annual harvest of approximately 440 st was reported in Norton Sound by the Japanese during 1968-1974. The Japanese gillnet fishery was prohibited in 1977.

Sac Roe

Domestic commercial effort resumed in Norton Sound in 1964 near Unalakleet and continued on a sporadic basis until 1979. Between 1964 and 1978 the fishery averaged about 14 short tons of herring annually and targeted on "spring herring" for sac roe extraction (Appendix Table D1). In 1979, a domestic herring fishery for sac roe began on a larger scale in Norton Sound when approximately 1,292 short tons (st) of herring were taken by 63 fishermen (13 purse seiners, 50 gillnetters). Purse seiners took 70% of the total catch.

After the 1979 season, the Alaska Board of Fisheries adopted a public proposal which made gillnets and beach seines the only legal commercial herring fishing gear within Norton Sound. A purse seine fishery could only be opened if the gillnet fleet could not take the allowable harvest. This regulation was an attempt to encourage involvement of local fishermen in this developing fishery. During the 1980 season, 294 gillnet fishermen harvested 2,452 short tons of herring (Appendix Table D3). Because gillnet fishermen demonstrated that they were capable of taking the available harvest, a regulation was passed in 1981 which prohibited any purse seine gear within Norton Sound.

Prior to the 1984 season, the harvest by beach seine fishermen was negligible. During 1984, ten beach seine fishermen harvested 327 st. During their 1984 fall meeting, the Board of Fisheries set a beach seine gear limit of 100 fathoms and limited the harvest to "not exceed 10 percent of the total herring sac roe harvest projection as published by the department." During the fall 1987 Board of Fisheries meetings, beach seine gear was further restricted to a limit of 75 fathoms. Beach seine harvests since 1985 have averaged 6.3% of the total reported harvest.

As with any developing fishery, fishing effort increased with each successive season. In 1984 Norton Sound became a Super-Exclusive Use herring fishing district in order to slow growth and bolster local involvement, but with only limited success. The 1987 season had the highest level of fishing effort on record with a total of 564 fishermen making at least one delivery, where 559 gillnet and 22 beach seine permits recorded landings. This was more than twice the average effort from 1980 through 1986. Local Norton Sound area residents accounted for 36% of the effort and 29% of the total harvest.

A public proposal to the Fall 1987 Board of Fish was adopted that changed the Norton Sound Herring Fishing District to Limited Entry status. Beginning with the 1988 season, a moratorium was placed on Norton Sound where no new entrants were allowed into the fishery. The Limited Entry Commission is reviewing and awarding limited entry permits to fishermen based on fishing history and will eventually reduce the total number to 301 gillnet and 4 beach seine permits as directed by the Board of Fish. Currently, some fishermen have already received limited entry permits and others are still fishing with interim-use permits while their eligibility is being evaluated on a case-by-case basis.

Commercial harvests from 1981-1984 averaged 4,137 st, and ranged from a low of 3,662 st in 1984 to 4,582 st in 1983 (Appendix Table D3). From 1985-1988, commercial herring harvests have averaged 4,374 st, ranging from a low of 3,548 st in 1985 to a high of 5,194 st in 1986. And most recently, from 1989-1991, harvests have averaged 5,596 st, ranging from 4,743 st in 1989 to 6,373 st in 1990. Level of commercial harvest is influenced by stock status, product value and climatic factors.

Spawn on Kelp

A small scale spawn-on-kelp (*Fucus*) fishery existed in Norton Sound from 1977 to 1984. Harvests during the 1977-1984 period ranged from less than one ton (1977) to approximately 46 st (1981). In addition, during the 1984 season, one ton of macrocystus kelp was imported into Norton Sound resulting in a harvest of approximately 3 st of product. In response to a public proposal, a Board of Fisheries action prior to the 1985 season resulted in the closure of all spawn-on-kelp fisheries in Norton Sound (Appendix Table D5).

Management Strategies

The overall statewide management strategy is to annually harvest 0-20% of the herring biomass. The upper end of the exploitation range is applied to stocks in good condition. The lower end of the exploitation range is applied to stocks that are exhibiting a trend of decreasing abundance and poor recruitment. If a minimum threshold level is not achieved, 7,000st for Norton Sound, no commercial fishery will be allowed.

Typically herring are long lived fish and will usually remain harvestable for at least 5 years after recruiting into the fishery. Harvesting only a percentage of the biomass ensures that some fish will be held over for following years. This type of strategy helps mitigate population fluctuations caused by successive years of poor recruitment, a common occurrence in marine spawning fish. Prior to 1983, harvests in Norton Sound were regulated on a subdistrict basis so harvests would be dispersed over the entire fishing grounds. This was to prevent harvest efforts from concentrating in one area on what was then thought to be a distinct stock of fish.

Since methods to reliably forecast herring returns are still being developed and estimates of recruitment are not available, in-season assessments of biomass supersede the projected biomass for management of the Norton Sound herring fishery. The herring biomass is managed for a 20% exploitation rate if the

in-season aerial biomass surveys and age class composition information indicate the run will achieve at least the preseason biomass projection. If the run does not materialize as projected, the harvest exploitation rate may be reduced to a lower level.

Generally, the fisheries management staff has tried to set fisheries openings to allow gillnetters to fish the flood tide as it crests. The belief that the ripe females approach the beach at that time to spawn figures heavily in that strategy. The Norton Sound fishery covers a large area with varying tides. Because the large gillnet fleet can not "fit" into individual subdistricts, opening at the optimal time throughout the district is not always possible. The fishing fleet must be flexible to maximize catches.

The beach seine openings are dependent on herring abundance near the beach and favorable weather conditions for spotters and fishing. Beach seiners prefer to work flood tides similar to those gillnetters favor, however, fisheries managers frequently provide less optimal fishing times. The beach seiners have shown the ability to harvest their allotment of 10% of the preseason harvest goal in a single three hour opening under ideal conditions. By the nature of the gear, beach seiners have the potential to wrap up large numbers of fish which could potentially exceed their allocation. Therefore, the management staff have often chosen to reduce the beach seine efficiency by allowing a gillnet opening to occur before the beach seine opening in order to break up school size and reduce the likelihood of excessive harvests. Occasionally, the beach seine fleet has been used to test the roe quality of herring newly arrived in nearshore waters prior to a gillnet opening where the potential for waste would have been great had the entire gillnet fleet fished on poor quality herring.

1995 SEASON SUMMARY

The 1995 Norton Sound herring fishery opened by emergency order on May 23. A total of six gill net openings occurred for 87.5 hours of fishing and four beach seine opening for 18.5 hours of fishing. An educational opening was allowed this year which occurred on May 26 and 27 in the vicinity of St. Michael. The fishery was conducted on two runs of herring that had two modes of abundance. The older age classes came to near shore waters first and roughly five days later the younger herring ripened and were available for harvest. Both runs were first apparent at Cape Denbigh, but the earlier run migrated south to spawn while the second run moved north. The total harvest based on fish ticket data was 6,762.9 short tons (st) of herring (Table 1). Since 1981, catches have averaged 4,222 st (Table 2).

There were 215 fishermen who made at least one delivery during the season. This is the same number of participants as the 1994 season, which was the lowest effort since 1984, excluding 1992 when there was no fishery. The low fishing effort this year is in part due to the buyers low harvest projections and the poor harvests in recent years.

During the 1995 season, 209 fishermen used gill nets, landing a total of 6032.6 st. The average sac roe recovery for gill net caught herring was 10.4%. Seven fishermen participated in the beach seine fishery, but only six made deliveries, landing 614.4 st of herring. The average sac roe recovery for

beach seine caught herring was 8.9% (Table 3). An effort was made to separate beach seiners from the gill net fleet to prevent gear conflicts and to enable the Department to better monitor the beach seine fishery. The beach seine fishery utilized different locations than the gill net fishery and was under the direct supervision of a biologist.

There were eight companies present on the grounds during the season to purchase herring. Three of these companies combined to report as one during the fishery. These 6 companies registered 11 processors and 45 tenders totaling 56 vessels (Table 4).

The average sac roe recovery for all gear types was 10.4%. The combined sac roe and bait roe percentage was also 10.4% due to the very small 115.8 st of bait contribution to the total harvest. Based on final operations reports, it appears the average price advanced for a short ton of 10% roe herring was approximately \$600.00. The average price paid to the fishermen for a short ton of 10.4% fish was approximately \$621.90. Of the 6762.8 st harvested, 115.8 st were purchased as bait herring (roe % less than 7.0%) for which fishermen received an average of \$50.00 per ton. The total value of the herring harvest to the fishermen was approximately \$4,205,847.51.

Conditions for aerial observation of herring biomass were generally fair to poor for the season (Table 5). The commercial fishery was managed using the preseason biomass projection, since the peak aerial survey did not occur until May 25. The peak aerial survey of 34,255 combined with estimated season's harvest to that date exceeded the projected biomass at 37,778.5 st. by 25%. The allowable harvest was 7,556 st, which left 783 st unharvested. The Norton Sound biomass was exploited at 17.9%.

Aerial surveys were flown on a regular basis from May 15 until June 7. The peak aerial survey occurred on May 25. One abandoned gillnet and one small pile of dead fish from a beach seine were sighted. Roughly five tons of wastage could be attributed to each sighting. No wastage was added to the harvest values or biomass estimates.

Fishery Management/Emergency Orders

The Norton Sound Herring Management Plan¹ stated that the Department would attempt to manage the fishery for marketable roe recovery. During 1995, industry standards called for 9.0% roe, as opposed to the Department standard of 8.5 in past years. Several companies set their standards at 10.0%, after the highly successful Togiak fishery. State of Alaska statutes direct that the resource should be managed so as to maximize the return to the State and the industry. Last year, the result of this higher standard was a decrease in the number of openings that could reasonably be expected to meet the quality standard. Fortunately, the higher quality standard had little affect on management during the 1995 season.

¹ Alaska Department of Fish and Game. April 1995. 1995 Herring Fisheries Management Plan. Regional Information Report No. 3A95-11. 8pp. Anchorage, Alaska.

The 1995 Norton Sound Herring Management Plan also stated a projected biomass of 30,257 st was expected to return this season. This projected return was based upon the 1994 escapement estimate, using a schedule of increasing natural mortality with age. The 1995 spawning biomass was expected to be dominated by age 7 and 9 and older age herring. If aerial survey observations and age class composition indicated a return of 31,088 st, then 20% or 6,218 st (5,596 st by gill nets, 622 st by beach seines) could be harvested.

The 1995 Norton Sound field season got underway May 15, with the first aerial survey, hiring of seasonal employees and the opening of the Unalakleet field office. Norton Sound sea ice cleared early this season. The first herring were sighted on an aerial survey May 19. The biomass was slow to build but, ripened quickly. Staff attributed that to the relatively small abundance of older age classes.

The fleet was put on three hour notice effective 8:00 a.m. May 22. Heavy spawn was observed that morning and the first opening was announced at 11:00 a.m. Several buyers and many fishermen were not prepared for the opening. Two independent aerial counts of fishing vessels estimated 110 vessels. The first opening in Subdistricts 1, 2, and 3 ran 23 hours. The extended opening filled the available processing capacity. Staff felt compelled to maximize the harvest because the bulk of the older herring were spawning and the gillnet fleet was best geared to harvest that component of the population. Staff had made the presumption that the preseason harvest estimate was appropriate even though the peak aerial survey to that date was far short of the preseason projection. The peak aerial survey occurred May 25.

Beach seining periods were allowed on May 24, 25, and 26 in the eastern Norton Sound subdistricts. The beach seine openings did not significantly effect processing capacity. Data from the seine fishery was employed to track roe quality and age composition. The May 26 seine samples agreed with the department's test fish samples which indicated nine year and older herring had completed spawning.

A second gillnet opening was allowed May 25 to offer a opportunity to utilize processors which had missed the first opening. The second opening targeted the declining older age classes. By the time of the closure, the processing capacity on the grounds was approaching its limit again.

Aerial surveys on May 27, indicated a 7,000 st biomass preparing to spawn in Subdistrict 5. Historically, herring in the Northern subdistricts move at constant rate to the west. A gillnet opening was announced as quickly as practical. The initial opening was extended several times as the roe quality continued to test well. As that migration of fish caused the fleet to move west, Golovin Bay was opened as well and a beach seine opening was allowed as the gillnet fleet vacated the few suitable seining sites after the closure. Both the gillnet and the seine opening were successful in that the buyers had little capacity left and the beach seine quota was filled.

Test fishing May 28 indicated that the 7 and 8 year old classes predominated in the southern subdistricts. The department found that mesh sizes less than three inches yielded the best catches. Relatively few gillnets of that size were available. In an effort to encourage fishermen to use the optimum size gear and to closely tend their nets, a one shackle opening was allowed. The period closed when catch levels dropped to very low levels.

A similar opening appeared feasible in Subdistrict 5 on the morning of May 30. The buying fleet was polled and no interest was expressed. By that evening several fishing groups had expressed an interest in an opening there. Unfortunately, the evening radio announcement had passed and staff felt an announcement could not be made before the morning radio schedule. Many of the fish had spawned by morning and consequently roe quality had declined. Several hours were spent testing before a suitable concentration of herring were located. Roe quality gradually declined and the period closed late that evening.

The staff continued the test fishing operations and aerial surveys for another week. The biomass that was observed was predominantly age six and younger and spawned out older age classes. The last survey in Subdistricts 1-5 was flown June 7.

Catch Reporting and Enforcement

Buyers registered for the 1995 season were required to report herring purchases daily (8:30 a.m.) and three hours following the closure of each period. As in past years, due to the scheduling of successive openings by gear type, clean-up catch reports were requested as soon as catch figures could become available. In general, compliance with requested catch reports was very good. The VHF radio turned out to be the communication equipment of choice due to the range of the SSB radio equipment. Communications with the field camps was accomplished with marine VHF, SSB or by aircraft radio from the aerial survey plane.

Protection efforts in Norton Sound consisted of four single engine aircraft (three super cubs on wheels and a C-185 on wheels) and a small boat. Personnel consisted of 4 permanent, full-time Fish and Wildlife Protection officers.

Fish and Wildlife Protection officers patrolled the grounds during each opening and closure. Three citations were issued for no crew license and two were issued for hiring a crew member without a license. No herring were confiscated by the State of Alaska during the 1995 season. The long openings of the 1995 fishery allowed most people ample time to make appropriate decisions regarding their participation in the fishery. The protection effort focused on preventative measures rather than on any particular problem.

Abundance and Research

Two Department field crews were operational during the 1995 season. One crew operated from Cape Denbigh and the second crew operated from Klikitarik. The test fish crews presence and sampling efforts on the herring grounds are critical to the proper management of the fishery and biological documentation of the stocks.

Unalakleet field office personnel during the season consisted of the area management biologist, the Norton Sound and Kotzebue assistant area management biologists, the catch monitor/public receptionist and the Nome administrative clerk. In addition, a fisheries technician was hired to fulfill

the commercial sampling requirements. The regional herring biometrician and a fisheries biologist from the anchorage office were present to provide overall quality control of herring sampling and assistance with sample collection and procedures, as was the regional management biologist whom assisted the staff in nearly every facet of the operation.

At the time of this report preparation, field data and herring scales collected during the season are being analyzed. The data will be formalized and presented in separate project and management reports later this season.

Biomass Determination

A complete listing of the aerial surveys flown in Norton Sound this season is found in Table 5. Historically, the season biomass has been the peak aerial survey combined with the harvest as of the day the peak aerial survey was flown. This is essentially what was done in 1995. The peak aerial surveys of Subdistricts 1, 2, and 3 were flown May 25. A relatively high survey of the more northerly subdistricts occurred the following day. The staff was of the opinion that the biomass seen near Elim on May 26 was not accounted for in the May 25 survey and so the two were combined. A peak survey of the northern subdistricts occurred June 3, but that survey was not used because of the possibility of a double count. Harvest was estimated to be the gillnet harvest through noon May 25 and beach seine harvest through May 24. The May 25 beach seine harvest occurred after the survey was flown, and was not included in the biomass estimate for that reason. Ten tons of waste were documented, an unreported harvest, and that too was added to the biomass estimate.

1996 Outlook

The 1996 Norton Sound herring biomass return is projected to be 27,307 tons (Hamner and Kerkvliet, 1996). A 20% exploitation rate would result in a harvest of 5,461 tons. Age 8 herring are expected to comprise 36% of the returning biomass while age 9 and older herring are expected to comprise about one-half of the biomass.

Table 18. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1995.

Date	Flight No.	Observer Initials	Survey		Spawn		Estimated Biomass (ST) By Index Area								TOTAL
			Hours	Rating	No.	Length (mi)	KLK	UNK	CDB	NTB	ELM	GOL	NOM		
5/15	1	FB	1.0	5	0	0.0		0.0	0.0	0.0	0.0			0.0	
5/18	2	TL	1.3	5	0	0.0	0.0	0.0	5.9					5.9	
5/19	3A	CL	2.0	4	0	0.0	77.5	0.0	130.5					208.0	
5/19	3B	TL	0.0	4	0	0.0	60.8	0.0	153.8					214.6	
5/20	4A	CL	2.3	4	11	0.3	355.2	0.0	364.0					719.2	
5/20	4B	FB	0.0	4	*14	*0.3	597.8	0.0	361.6					959.4	
5/21	5A	FB	2.3	4	33	1.5	255.9	121.6	169.6					547.1	
5/21	5B	TL	0.0	4	*18	*1.1	305.1	585.7	352.5					1,243.3	
5/22	6	FB	2.0	3	103	4.7	1,975.8	579.6	1,064.1					3,619.5	
5/23	7A	CL	4.2	4	77	23.1	2,151.4	346.6	261.4	89.1	31.0			2,879.5	
5/23	7B	TL	0.0	3	*126	*16.1	4,831.6	1,188.4	917.4	155.9	264.9			7,358.2	
5/24	8A	CL	2.8	4	184	11.7	1,661.9	5,921.6	7,068.5					14,652.0	
5/24	8B	FB	0.0	4	*206	*12.5	2,347.8	6,660.4	6,897.0					15,905.2	
5/25	9A	TL	4.5	4	121	4.2	1,967.1	6,640.9	6,337.3	0.0	410.0	9.1		15,364.4	
5/25	9B	FB	0.0	3	*93	*2	2,354.9	19,003.6	5,788.1	0.0	254.4	7.6		27,408.6	
5/26	10A	CL	2.5	4	41	1.1	3,984.2	976.1	7,245.1					12,205.4	
5/26	10B	TL	0.0	4	*43	*1.8	5,296.0	681.3	16,326.5					22,303.8	
5/27	11A	CL	0.0	0	7	0.7	482.9	0.0	15.2	0.0	7,108.1			7,606.2	
5/27	11B	FB	4.2	4	*9	*.4	601.5	0.0	13.7	0.0	5,139.9			5,755.1	
5/27	12	CL	1.0	4	6	0.4	332.3	0.0						332.3	
5/28	13A	FB	4.0	4	31	1.0	174.8	0.0	346.5	0.0	5,384.7	1,905.5		7,811.5	
5/28	13B	TL	0.0	4	*40	*1.1	439.8	0.0	560.0	0.0	4,125.1	1,345.1		6,470.0	
5/29	14A	CL	4.0	4	9	0.3	280.3	0.0	1,642.9	596.4	2,506.1	355.8	12.9	5,394.4	
5/29	14b	TL	0.0	3	*12	*0.5	1083.9	0.0	1503.0	1278.8	2157.3	1612.6	28.4	7664.0	
5/30	15a	CL	0.0	3	25.0	2.4	1175.8	12.9	1573.2	235.8	2071.7	1472.0	131.6	6673.0	
5/30	15b	FB	3.7	4	*34	*2.3	2104.9	12.9	2104.7	407.0	2044.1	1976.6	105.8	8756.0	
5/31	16	TL&FB	2.7	4	13.0	0.8		3646.5	7478.0	574.1	2240.4	813.0	581.7	15333.7	
6/1	17	CL	4.5	3	1.0	0.1	256.9	1473.1	5237.5	2227.5	2936.7	115.5	145.9	12393.1	
6/2	18	CL	3.0	3	7.0	0.2		1472.6	4845.9	1817.8	1277.2	964.6	212.8	10590.9	
6/3	19	FB	2.0	4	6.0	0.5		0.0	2661.8	1958.0	6493.6	2047.1	459.7	13620.2	
6/5	20	FB&CL	3.2	3	1.0	0.0		38.7	1272.5	4532.9	5285.9	797.5	60.7	11988.2	
6/7	21	CL	3.0	3	1.0	0.0		0.0	1497.9	91.2	0.0	42.6	489.6	2121.3	
6/14	22	FB	1.8	5	0.0	0.0							0.0	0.0	
Sum	-		62.0	4	677.0	53.0			Waste	10.0	Harvest	6762.9	Total Hvst.	6772.9	
							2354.9	19003.6	5788.1	0.0	7108.1	0.0	Survey	34254.7	
Rating	Excellent=1								Harvst 5/25 befor survey		3513.8		Biomass	37778.5	
	Unacceptable=5								Remaining Harvest		782.8				
									Potential Harvest		7555.7		Exploit%	17.93%	

Table 19. Norton Sound herring spawn estimates by subdistrict (s.d.), 1995.

Date	s.d. 1		s.d. 2		s.d. 3		s.d. 4		s.d. 5		s.d. 6		s.d. 7		Totals	
	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles
5/15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/18	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/19	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/20	11	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	11	0.3
5/21	33	1.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	33	1.5
5/22	103	4.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	103	4.7
5/23	77	23.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	77	23.1
5/24	180	11.7	0	0.0	4	0.0	0	0.0	0	0.0	0	0.0	0	0.0	184	11.7
5/25	113	4.0	8	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	121	4.2
5/26	39	1.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	41	1.1
5/27	7	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	0.7
5/27	6	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.4
5/28	27	0.8	0	0.0	0	0.0	0	0.0	4	0.2	0	0.0	0	0.0	31	1.0
5/29	6	0.1	0	0.0	0	0.0	0	0.0	3	0.2	0	0.0	0	0.0	9	0.3
5/30	17	1.8	0	0.0	0	0.0	1	0.2	7	0.4	0	0.0	0	0.0	25	2.4
5/31	0	0.0	0	0.0	0	0.0	0	0.0	13	0.8	0	0.0	0	0.0	13	0.8
6/1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	1	0.1
6/2	0	0.0	0	0.0	0	0.0	0	0.0	7	0.2	0	0.0	0	0.0	7	0.2
6/3	0	0.0	0	0.0	0	0.0	0	0.0	5	0.4	1	0.1	0	0.0	6	0.5
6/5	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
6/7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0
6/14	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals	619	50.1	8	0.2	7	0.1	1	0.2	40	2.3	1	0.1	1	0	677	53.0

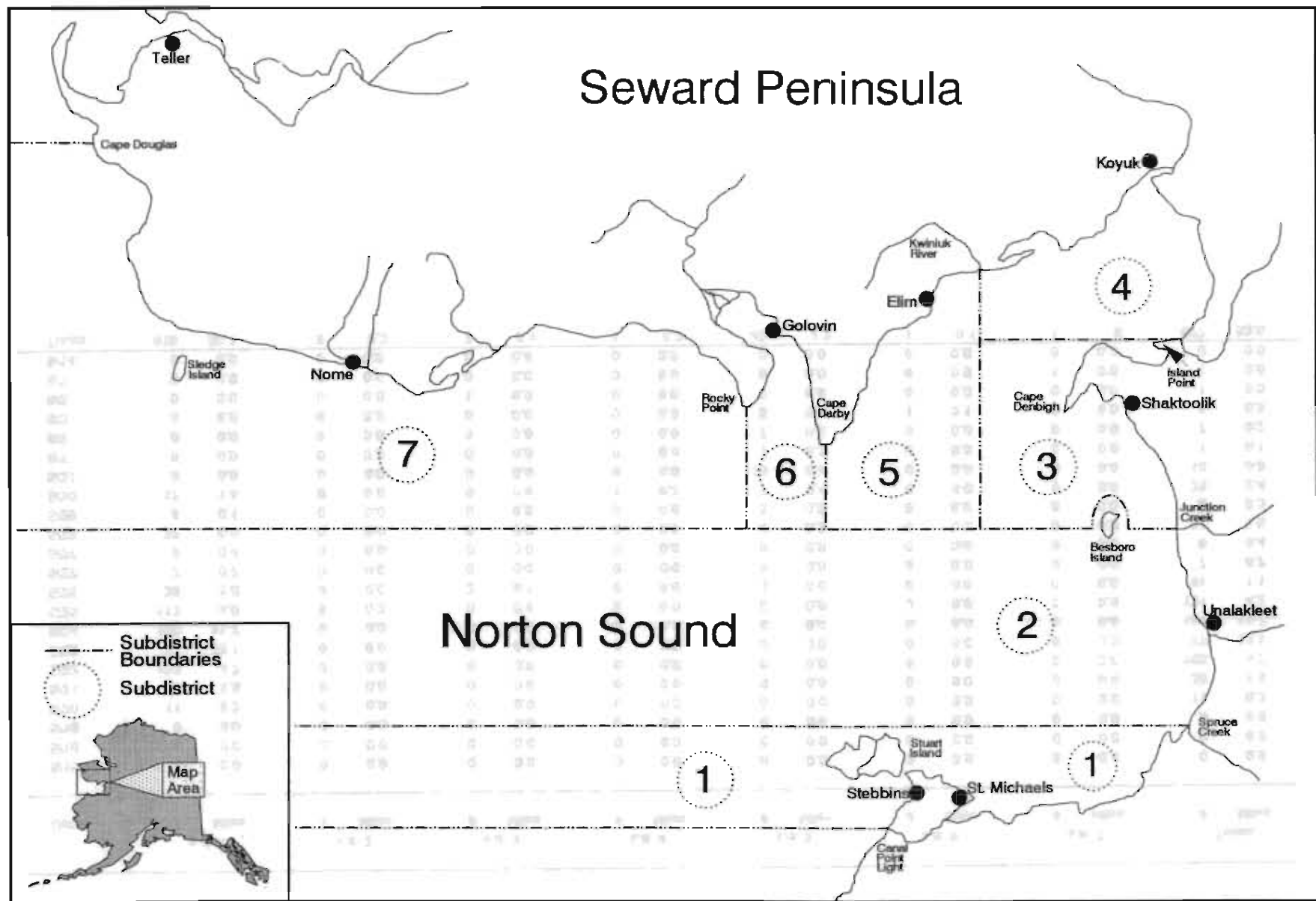


Figure 11. Norton Sound commercial herring district (333) and statistical boundaries.

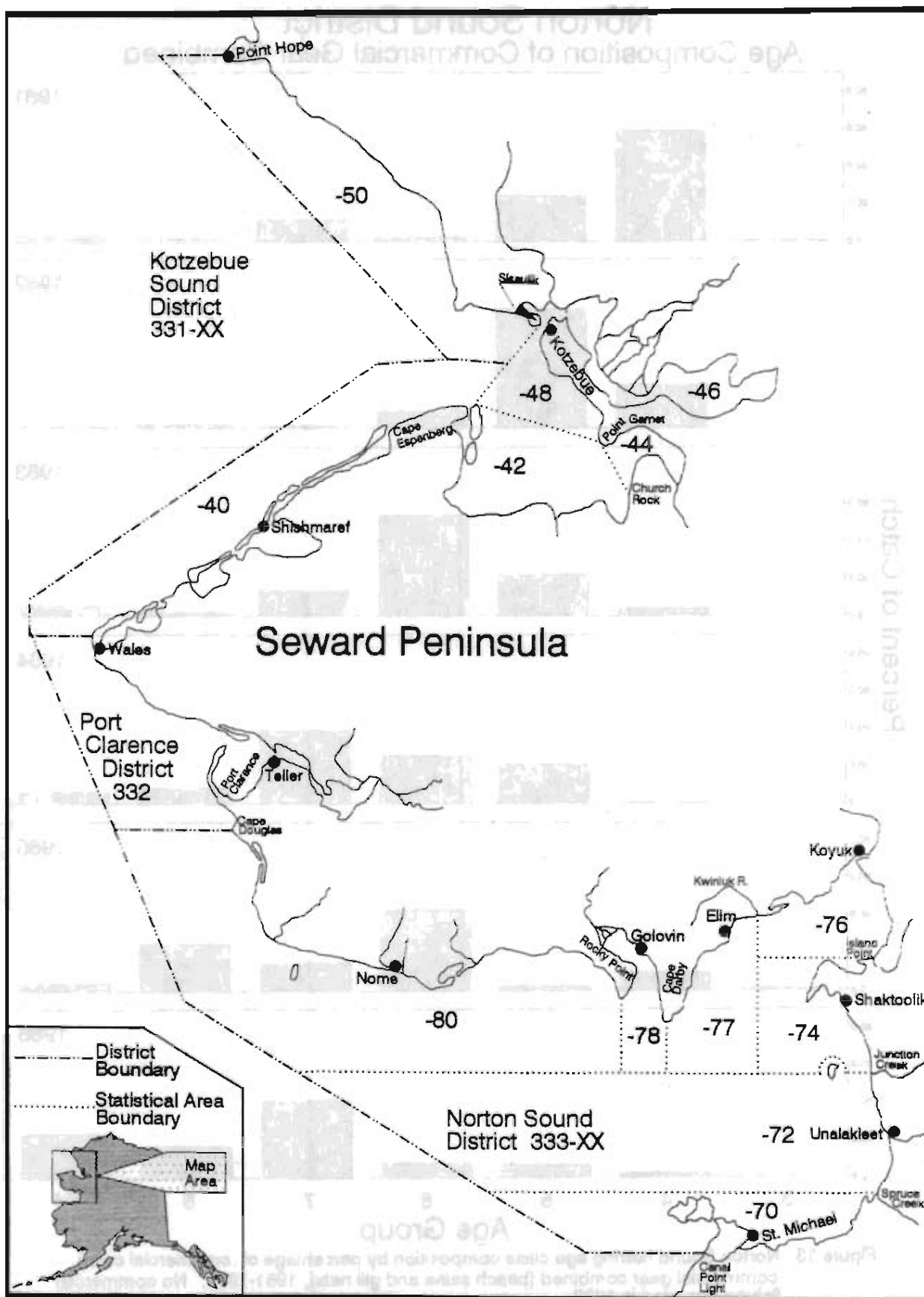


Figure 12. Statistical areas of the Norton Sound, Port Clarence and Kotzebue commercial herring fishing districts.

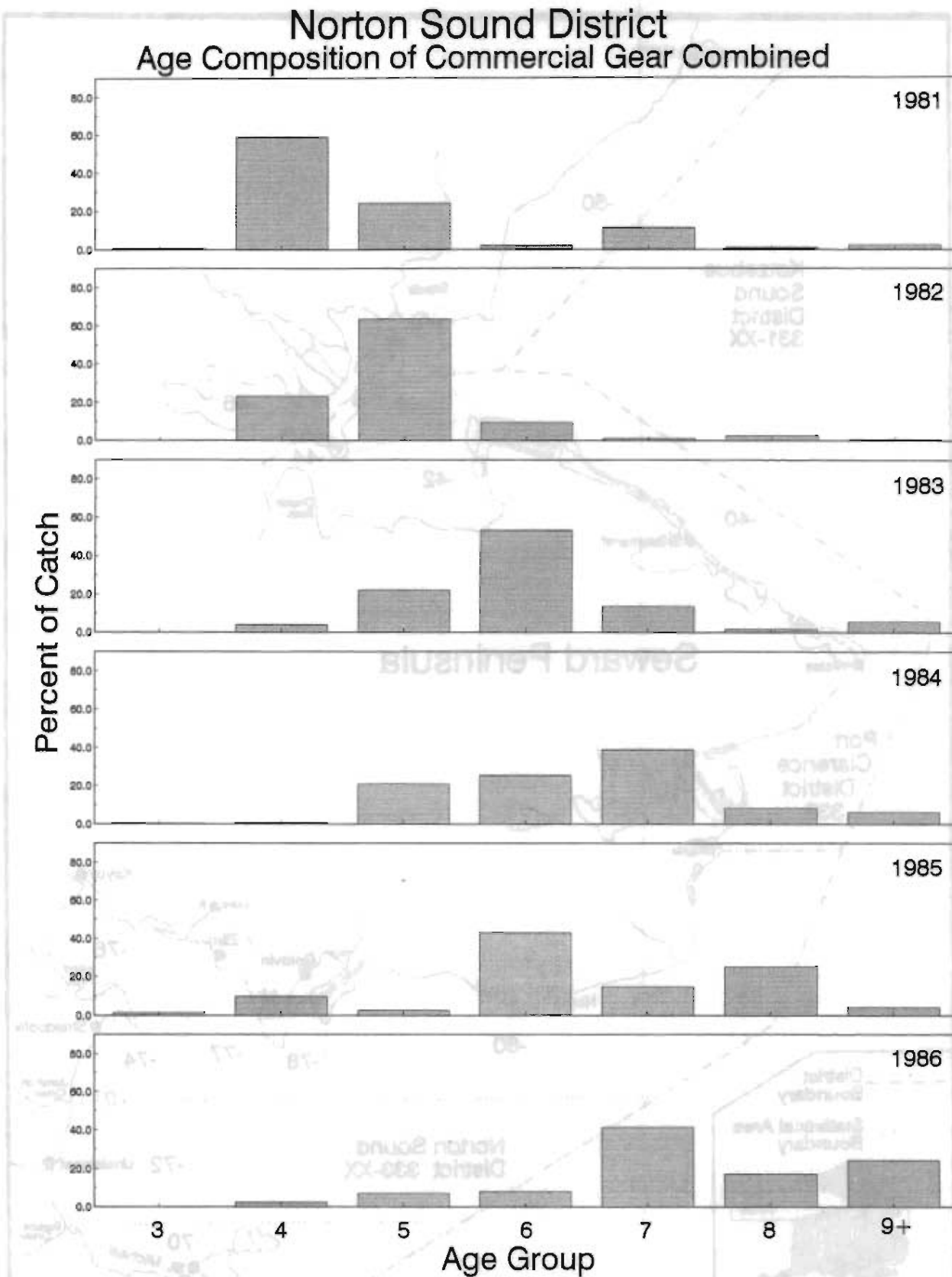


Figure 13. Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gill nets), 1981-1995. No commercial fishing occurred in 1992.

Norton Sound District Age Composition of Commercial Gear Combined

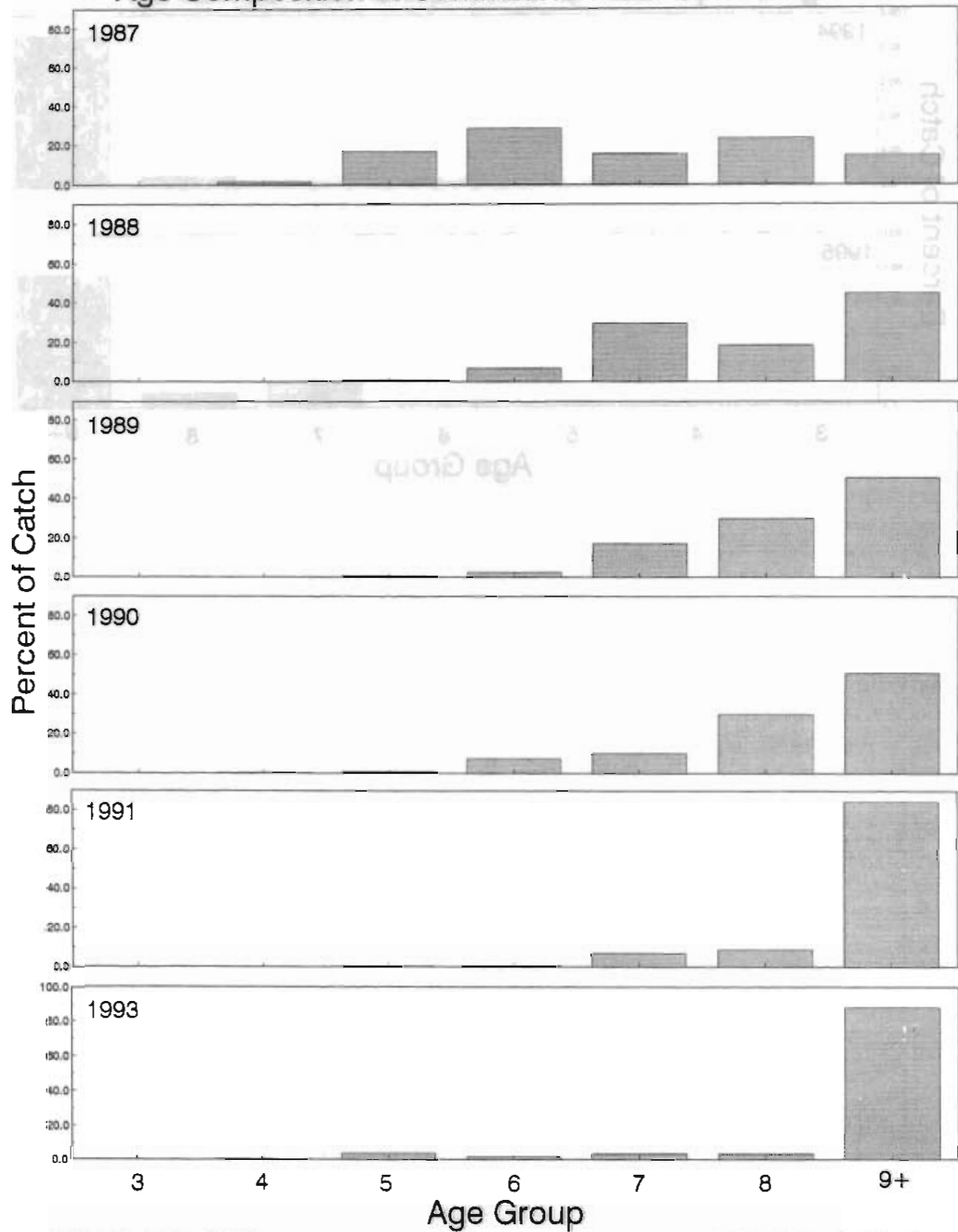


Figure 13. (page 2 of 3)

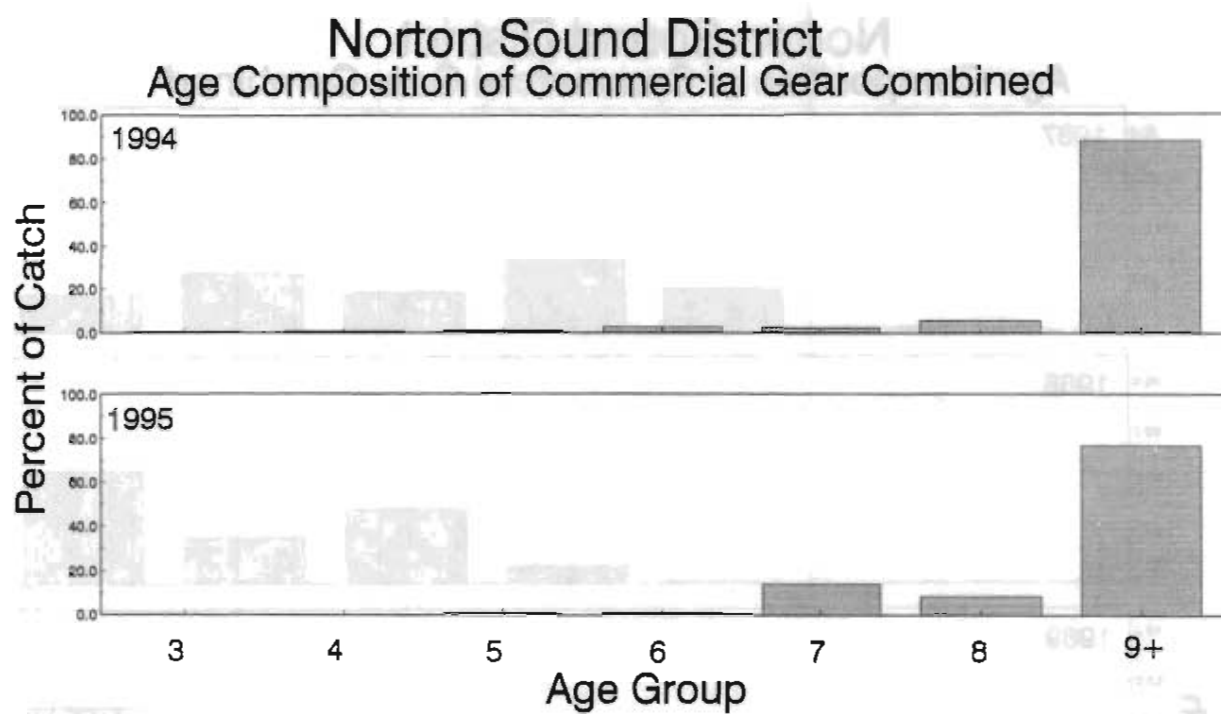


Figure 13. (page 3 of 3)

Norton Sound District Age Composition of Variable Mesh Gill Nets

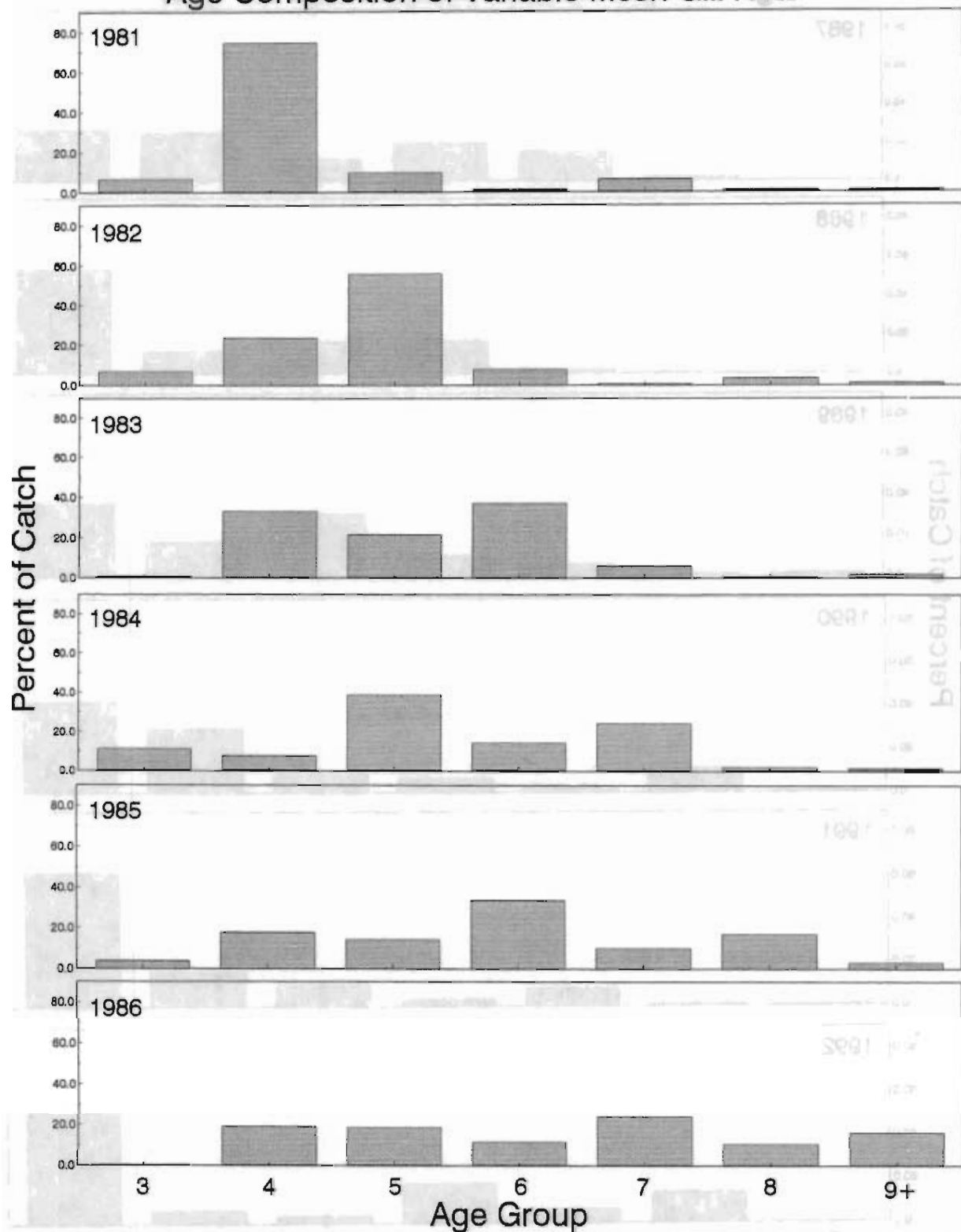


Figure 14. Norton Sound herring age class composition by percentage of total catch, variable mesh gill nets, 1981-1995.

Norton Sound District Age Composition of Variable Mesh Gill Nets

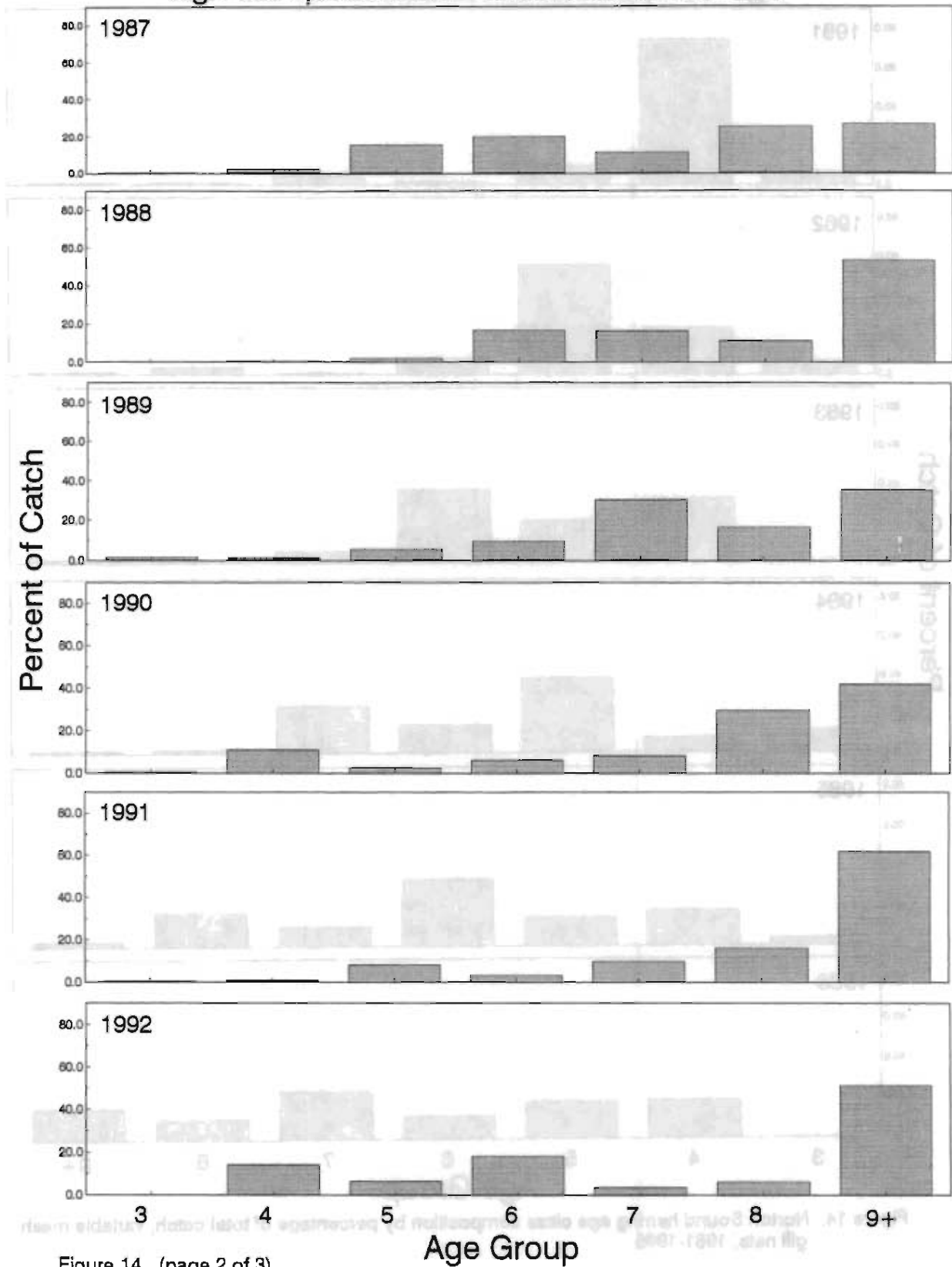


Figure 14. (page 2 of 3)

Norton Sound District Age Composition of Variable Mesh Gill Nets

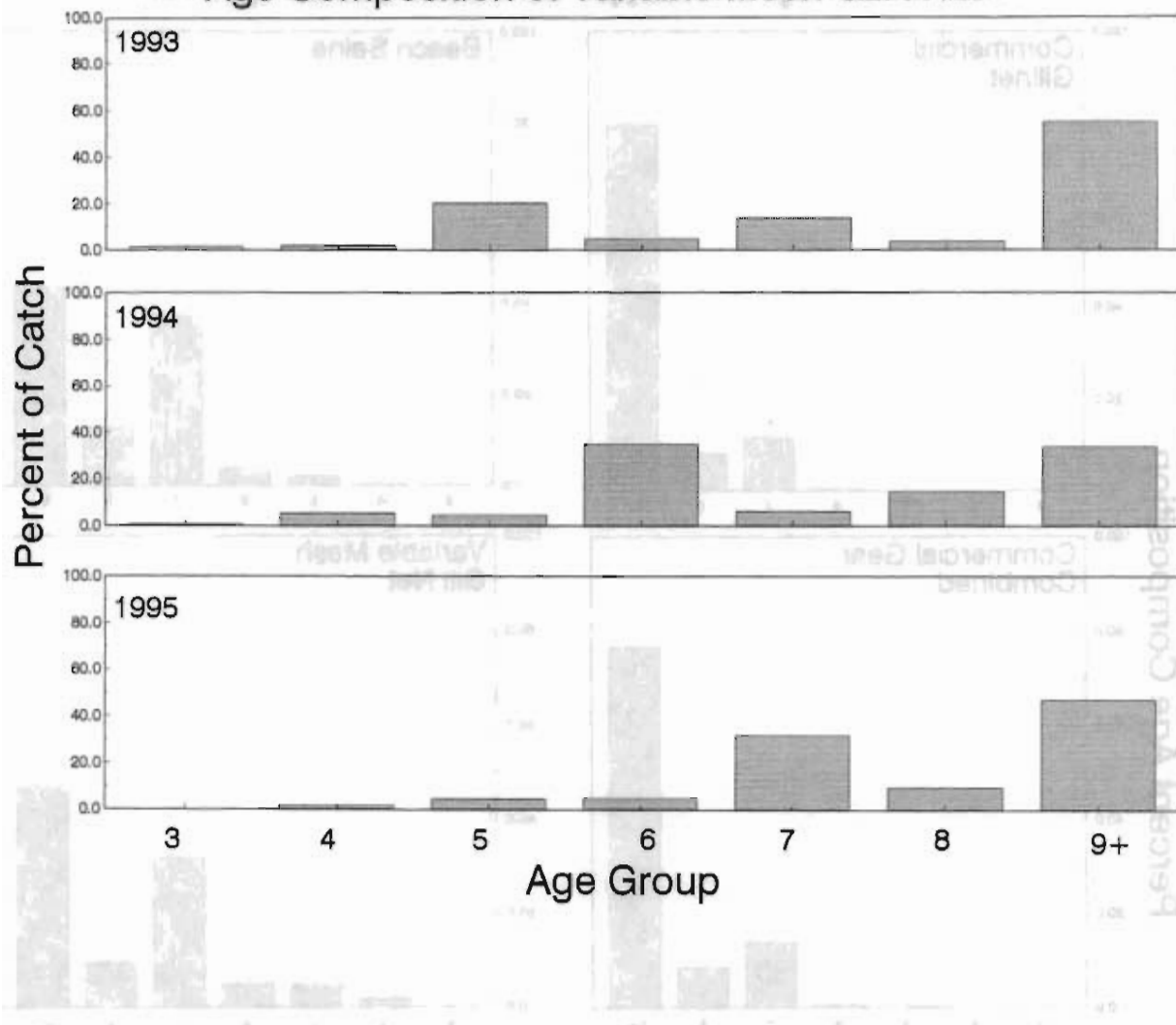


Figure 14. (page 3 of 3)

Norton Sound Herring

1995 Catch by Gear Type and the 1996 Projection

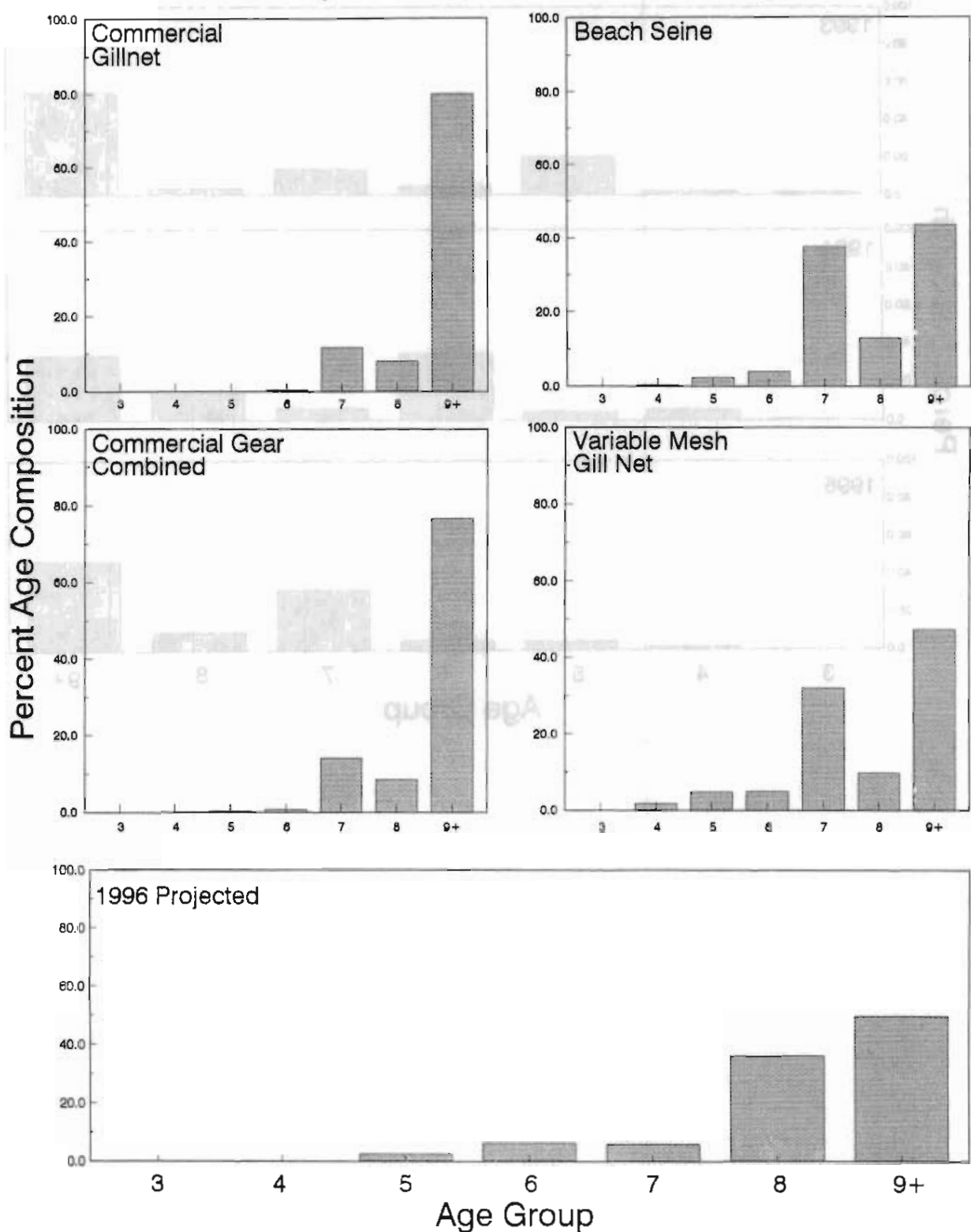


Figure 15. Norton Sound Pacific herring age composition comparison by gear type of capture, 1995, and the projected age composition of the 1996 return.

Appendix Table D1. Norton Sound herring and spawn-on-kelp harvests
(in short tons) by U.S. commercial fishermen, 1909-1995.

Year	Sac Roe Herring	Food or Bait Herring	Total	Spawn-on-kelp
1909-1916 ^a	-	-	-	-
1916-1928	-	1881	1881	-
1929	-	166	166	-
1930	-	441	441	-
1931	-	86	86	-
1932	-	529	529	-
1933	-	31	31	-
1934	-	4	4	-
1935	-	15	15	-
1936	-	-	-	-
1937	-	6	6	-
1938	-	10	10	-
1939	-	6	6	-
1940	-	14	14	-
1941	-	3	3	-
1942-1963	-	-	-	-
1964	20	-	-	-
1965	-	-	-	-
1966	12	-	-	-
1967	-	-	-	-
1968	-	-	-	-
1969	2	-	-	-
1970	8	-	-	-
1971	20	-	-	-
1972	17	-	-	-
1973	35	-	-	-
1974	2	-	-	-
1975	-	-	-	-
1976	9	-	-	-
1977	11	-	-	trace
1978	15	-	-	4
1979	1292	-	-	13
1980	2451	-	2452	24
1981	4371	-	-	47 ^b
1982	3864	69	3933	38
1983	4181	401	4582	29 ^c
1984	3298	274	3572	19 ^d
1985	3420	128	3548	- ^e
1986	4926	268	5194	-
1987	3779	303	4082	-
1988	4256	416	4672	-
1989	4494	247	4741	-
1990	5253	1026	6279	-
1991	5465	207	5672	-
1992 ^f	-	-	-	-
1993	4713	321	5034	-
1994	958	2	960	-
1995	6647	116	6763	-

^a Fishery occurred some years, but harvest unavailable.

Fishery from 1909-1941 occurred near Golovin; 1964 to present has occurred in southeast Norton Sound.

^b Does not include approximately 6 st of wastage.

^c Does not include approximately 2 st of wastage.

^d Includes 3 st of spawn on *Macrocystus* kelp.

^e All spawn-on-kelp fisheries closed by regulation prior to the 1985 season.

^f No commercial fishery took place in 1992.

Appendix Table D2. Japanese gillnet herring catches in Norton Sound, 1968-1977.
(North of 63 N. Latitude and East of 167 W. Longitude)

Year	Gillnet Catch (st)	Remarks
1968	131	First foreign effort on herring in Norton Sound
1969	1400	Peak catch with large effort (about 40 ships). Two vessels apprehended.
1970	69	
1971	703	
1972	15	
1973	38	
1974	764	
1975	0	
1976	-	Data unavailable.
1977	-	Herring fishery closed to foreign nations.
Total	3120	Excludes 1976 catches.

Appendix Table D3.

Herring biomass estimate and commercial fisheries data for the Norton Sound District, 1979 -1995.^m

Year	Biomass ^a (st)	Harvest ^b (st)	Percent Exploitation ^c	Roe %	Dollar Value (millions)	Number of Fishermen
1979	7,700	1,292	16.8	7.0	0.6	67
1980	8,400	2,452	29.2	8.1	0.5	294
1981	25,100	4,371	17.3	8.8	1.5	332
1982	17,400	3,933	22.6	8.8	1.0	237
1983	28,100	4,582	16.3	8.6	1.4	272
1984	23,100	3,662 ^a	15.8	10.3	0.9	194
1985	20,000	3,548	17.7	9.9	1.4	277
1986	28,062	5,194	18.5	9.6	2.9	323
1987	32,370	4,082	12.6 ^f	8.6	2.6	564
1988	33,924	4,672	13.8 ^g	9.0	3.9	348
1989	23,857	4,771 ⁱ	20.0 ^h	9.2	2.3	357
1990	35,522 ^h	6,439 ^j	18.0	8.7	3.6	365
1991	42,854	5,796 ^k	13.5 ^f	9.3	2.4	279
1993	46,549	5,034 ^l	10.9	9.9	1.5	264
1994	37,829	960	2.5	10.3	0.3	215
1995	37,778	6,773	18.0	10.4	4.2	215

Methods of calculating biomass have varied over the years. Biomass estimates listed follow methods used during that year.

^b Includes both bait and gas roe harvests.

^c Represents total District exploitation. During many years southern subdistricts are closed because exploitation of the local biomass reaches 20%, while northern subdistricts have remained open because little or no harvest has occurred.

^d Minimal biomass estimates due to poor survey conditions.

^e Includes an estimated 90 st of wastage.

^f Peak estimate made after the commercial fishery; the fishery was not re-opened due to the high probability of spawnouts present after two consecutive days of heavy spawning.

^g Peak biomass was sighted prior to arrival of the commercial buying fleet.

^h Biomass spotting conditions very poor throughout herring season; peak biomass represents minimum estimates; exploitation rate based on observed biomass.

ⁱ Includes an estimated 30 st of wastage.

^j Includes an estimated 60 st of wastage.

^k Includes an estimated 125 st of wastage.

^l Does not include an estimated 45 st of wastage.

^m No herring fishery occurred in 1992.

Appendix Table D4. Norton Sound commercial herring harvest (st) by subdistrict, by year, 1979 - 1995.^a

Year	Subdistricts							Totals
	s.d. 1	s.d. 2	s.d. 3	s.d. 4	s.d. 5	s.d. 6	s.d. 7	
1979	319	405	555	-	-	-	14	1293
1980	1176	632	632	5	-	7	-	2452
1981	3068	831	471	1	-	-	-	4371
1982	2062	946	925	-	-	-	-	3933
1983	434	1265	2733	-	65	85	-	4582
1984	-	-	3572	-	-	-	-	3572
1985	1538	188	1675	-	147	-	-	3548 ^b
1986	2559	-	2450	-	185	-	-	5194
1987	2218	174	1690	-	-	-	-	4082
1988	3260	99	1307	-	6	-	-	4672
1989	3256	60	1425	-	-	-	-	4741 ^c
1990	4498	950	931	-	-	-	-	6379 ^d
1991	-	880	4792	-	-	-	-	5672 ^e
1992	-	-	-	-	-	-	-	0
1993	2288	587	1881	-	278	-	0.2	5034.2 ^d
1994	250	36	634	-	40	-	-	960
1995	2359	604	1524	-	2108	167	-	6762

^a Includes herring taken for sac roe and bait.^b Does not include an estimated 90 st of wastage.^c Does not include an estimated wastage of 30 st in abandoned gillnets.^d Does not include an estimated wastage of 60 st in abandoned gillnets.^e Does not include an estimated wastage of 125 st in abandoned gillnets.^f No commercial fishery in 1992.^g Does not include an estimated wastage of 45 st in abandoned beach seine sets.

Appendix Table D5. Norton Sound commercial spawn-on-kelp (Fucus) harvest, 1978-1984. ^a

Year	st	Number of Fishermen
1978	4	9
1979	13	19
1980	24	20
1981	47	22
1982	38	44
1983	29	35
1984	19	32

^a Norton Sound commercial spawn-on-kelp harvest closed by regulation prior to the 1985 season.

PORT CLARENCE / KOTZEBUE DISTRICTS

Introduction

The regulation book states that in the Port Clarence and Kotzebue Districts, herring may be taken from April 15 through November 15, except that herring may not be taken during the open commercial salmon fishing season. However, prior to the 1987 season, no spring sac roe commercial fisheries had ever occurred within these districts. Interest in exploring these stocks has been expressed in recent years by industry personnel operating in the Norton Sound District. However, no large scale effort to develop the fishery has occurred due to the late ice breakup and fishery timing in the Port Clarence and Kotzebue Districts.

The Port Clarence and Kotzebue commercial herring fisheries have been in regulation since 1982. The 1983 and 1984 regulation books set a guideline harvest of 150 mt (165 st) for each district. Since the guideline harvest has never been changed or repealed by the Board of Fisheries, it is assumed 165 st guideline harvest is still in effect. Presently purse seines, beach seines, and gillnets are legal commercial gear within these districts.

Local fishermen from Teller, Shishmaref, and Kotzebue have also expressed increasing interest in exploiting these stocks. While small harvests of herring for food/bait have occurred during the fall, the fisheries in these districts have been limited by lack of markets. Local fishermen and fishery operators in Kotzebue, Brevig Mission and Nome have also expressed interest in developing a spawn-on-kelp fishery within these districts.

Resource Investigations

Resource investigations of Port Clarence and Kotzebue Sound area herring stocks were conducted by ADF&G from March 1976-September 1978 (Barton 1978). These studies indicated that herring populations from Golovin Bay (Norton Sound) northward differed significantly in size and behavioral characteristics from herring populations occurring in the southern Bering Sea. Differences between populations were summarized as follows (Barton, 1978).

Seward Peninsula Populations

Smaller herring at age with lower vertebral counts.

Lower abundance.

Subtidal spawning (3m) in shallow bays, inlets and lagoons.

Zosteria sp. primary spawning substrate.

More euryhaline.

Overwinter in shallow bays; water is warmed by river discharge under ice cover.

Fall (non-spawning) runs documented.

Larval development in brackish water.

Data collected from herring populations along the Seward Peninsula strongly indicated that a separate stock of herring occurs in the Port Clarence and Kotzebue Sound areas. This does not preclude the possibility of the occurrence of more southern stocks from utilizing this region, i.e., stocks which winter near the Pribilof Islands and migrate to the western Alaska coast to spawn. It is unlikely however, that herring stocks along the western Seward Peninsula migrate to the central Bering Sea for wintering, but rather remain in coastal lagoons, bays or inlets which are warmed by river discharge under the ice (Barton 1978). This may be a major factor in explaining size differences, i.e., environmental conditions. Water temperatures and feeding conditions in deep ocean waters are probably more favorable for growth than those in herring winter habitats along the Seward Peninsula, which apparently have become adapted to Arctic conditions (Barton 1978).

Southern Norton Sound to Southern Bering Sea Pelagic Populations

Larger herring with probable higher vertebral counts.

Higher abundance.

Intertidal and shallow subtidal spawning along exposed rocky headlands.

Fucus sp. primary spawning substrate.

Less euryhaline.

Overwinter in deep ocean layers near the Pribilof Islands.

No fall runs documented.

Larval development probable in more saline water.

Aerial surveys are very difficult in the Port Clarence District due to organic coloring of the waters of Imuruk Basin, Tuksuk Channel, Grantley Harbor and to a lesser extent, Port Clarence. Aerial surveys were impractical in Imuruk Basin and Tuksuk Channel. Additionally, the presence of other species of fish caught in test commercial gear sets indicate the need for verifying any biomass sighted. A further

complicating factor within Port Clarence is the spring ice conditions. The Port is a very sheltered body of water which becomes stained to a high degree over the winter and takes some time to clear once the ice melts. Typically, the outside waters are significantly warmer than the inside waters which are covered by ice longer thereby slowing solar gain and water mixing. Soon after the ice begins to shift the herring move into the warm shallow lagoons to spawn. The herring are invisible to aerial observation once they enter the stained water. The best aerial survey conditions exist just outside the entrance to the Port, where the herring mass just prior to the ice moving. One or two surveys have been flown each of the past several years, but virtually no herring have been observed because the narrow window of time for seeing the fish has been missed.

Fall Food/Bait Fishery

Although a fall fishery has probably existed for subsistence use within these areas for many years, a commercial venture has only been attempted recently. The primary use of those fish are for crab bait and dog food. The fishery typically occurs during September and the ice free portion of October. The harvest has been facilitated by a fish buyer located at Nome in 1994 and 1995 who provided a ready crab bait market and transportation for the fish.

Sac Roe Fishery

The Port Clarence fishermen have been unable to attract a sac roe buyer for their relatively late fishery. During 1991, one individual imported macrocystus kelp and attempted an open pound. No herring spawned on the imported kelp, although ripe herring were found in close proximity and very light spawn was found on blades of *Zosteria* sp. nearby.

The spring fishery is usually thought of as a sac roe fishery, however, in 1995 those herring harvested were purchased as bait for the Norton Sound King Crab fishery. Also new in 1995 was the issuance of an Emergency Order that restricted the harvest area by closing Grantley Harbor. Several residents from the villages of Teller and Brevig Mission were concerned that there was high incidence of no-target species being caught and wasted in that area. It is also believed that the small local herring stock was being targeted rather than the intended migrating pelagic Bering Sea stock because of differences in appearances.

Aerial surveys are very difficult in the Port Clarence District due to organic coloring of the waters of Inupiat Basin, Tukuk Channel, Grantley Harbor and to a lesser extent Port Clarence. Aerial surveys were impractical in Inupiat Basin and Tukuk Channel. Additionally, the presence of other species of fish caught in test commercial gear sets indicate the need for very high survey effort. A further

Table 20. Port Clarence District commercial herring fishing history.

Year	Fishery	Effort	Harvest	Price	Value
1986	Fall Bait	1 Permit (G/N)	130 lbs.	\$1.00/lb	\$ 130
1987	Sac Roe	3 Purse Seiners 3 Gillnetters	145.5 st	\$800/st@10%	\$ 77,466
1987	Fall Bait	? Permits (G/N)	1,100 lbs	\$.30/lb	\$ 330
1988	Sac Roe	3 Purse Seiners 3 Gillnetters Combined Total	56.4 st @7.6% 23.6 st @8.9% 80.0 st @8.2%	\$1000/st @10%	\$ 57,500
1994	Fall Bait	4 Permits (G/N)	8,706 lbs	\$.45/lb	\$ 3,917
1995	Spring Bait Fall Bait	8 Permits (G/N) 2 Permits (G/N) Combined Total	19,193 lbs 9,119 lbs 28,312 lbs	\$.61/lb \$.37/lb \$.53/lb	\$ 11,625 \$ 3,393 \$ 15,018

Table 20. Port Clarence District commercial herring fishing history.

Year	Fishery	Effort	Harvest	Price	Value
1986	Fall Ball	1 Permit (GN)	130 lbs	\$1.00/lb	\$ 130
1987	2ac Roe	3 Purse Seineers 3 Gillnetters	142.5 st	\$800/st @ 10¢	\$ 77,466
1987	Fall Ball	7 Permits (GN)	1,100 lbs	\$ 30/lb	\$ 330
1988	2ac Roe	3 Purse Seineers 3 Gillnetters	142.5 st	\$800/st @ 10¢	\$ 77,466
1988	Fall Ball	4 Permits (GN)	5,708 lbs	\$ 45/lb	\$ 2,569
1989	Spring Ball	8 Permits (GN)	18,193 lbs	\$ 61/lb	\$ 11,123
1989	Fall Ball	5 Permits (GN)	9,119 lbs	\$ 37/lb	\$ 3,383
		Combined Total	28,312 lbs	\$ 88/lb	\$ 12,018

SECTION 3: KING CRAB
(Includes Norton Sound,
Port Clarence and Kotzebue Districts)

SECTION 3 - KING CRAB

INTRODUCTION

Norton Sound

The Norton Sound section of the Northern District in Area Q is described in the shellfish regulations as all waters east of 168 degrees W. long., between the latitudes of Cape Romanzof and Cape Prince of Wales (Figure 1). The only shellfish fishery in Norton Sound is for red king crab (*Paralithodes camtschatica*). Blue king crab (*P. platypus*) and Tanner crab (*Chionoecetes opilio*) also occur within this section but are very seldom caught by commercial or subsistence fishermen. Red king crab have been utilized for subsistence purposes by local residents for many years, but the commercial fishery was not initiated until 18 years ago. In April 1977, the Alaska Board of Fisheries opened an "exploratory" commercial fishery in order to increase the knowledge and commercial utilization of Norton Sound king crab. Since 1976 there have been six National Marine Fisheries Service (NMFS) research trawl studies in Norton Sound. The most recent survey was conducted in 1991 (Table 3, Figures 3 & 4). In addition, the State of Alaska Department of Fish and Game (ADF&G) has conducted four research pot fishing studies. Data from population studies, from winter research studies, mining impact studies, and from 17 commercial fishing seasons has greatly increased the knowledge of the Norton Sound king crab. There are two seasons during which crab may be taken commercially: November 15 - May 15 and July 1 - September 3.

St. Lawrence Island

The St. Lawrence Island section lies immediately west and north of the Norton Sound Section. Until recently, the St. Lawrence Island section has been managed by Westward Region's Dutch Harbor office since the Bering Sea crab fleet bases there and has been open to commercial fishing for the same amount of time as the Norton Sound section. The only reported commercial catches to date in the St. Lawrence Island section were made in 1983 when 52,557 pounds of blue king crab were delivered from 13 landings, in 1989, when 3,603 pounds of red king crab and 984 pounds of blue king crab were delivered from 8 landings and in 1992 when 53 pounds of blue crab were landed.

In 1983 the commercial crab fleet concentrated near the southeast shore of St. Lawrence Island. The following year a regulation proposal to close the waters within 10 miles of all inhabited islands within the section was adopted in an attempt to protect stocks targeted by local fishermen and reduce impacts on subsistence marine mammal harvests during the winter. During the 1989 season, relatively few blue king crab were taken near rocks and shoals still open to commercial fishing, but red king crab were discovered in low densities near Kivalina, the northern boundary of the section. The villagers of Little Diomed Island have also traded and sold winter caught blue king crab with residents of Nome and other villages for years. The Department has not been able to obtain an

accurate record of the magnitude of this trade. The remoteness of this village is also a factor contributing to the lack of catch records. Current regulation allows the commercial harvest and sale of king crab near shore during the winter. The Board provided the same provisions in the regulation as are in effect for Norton Sound to allow a commercial winter fishery. However, local residents of St. Lawrence Island have decided not to export any of their winter catch for commercial sale.

1995 COMMERCIAL FISHERY

Norton Sound Summer Commercial Fishery

A total of 48 catcher vessels took part in the 1995 summer commercial red king crab fishery in the Norton Sound Section. The total number of crab caught was 105,967 and the total number of pots pulled was 18,782. The CPUE was 5.6 crab/pot. Total harvest was 322,676 pounds of king crab. The harvest goal was 340,000 pounds or roughly 10% of the legal male population estimated by the 1991 National Marine Fisheries Service trawl survey. Average weight per crab was 3.1 pounds.

Board of Fisheries regulations specific to Norton Sound Section are:

- 1) 5AAC 34.915, which directs the Department to manage the Norton Sound summer king crab fishery for a harvest of one half the exploitation rate determined under 5AAC 34.080.
- 2) 5AAC 34.935, which established a closed area with a defined boundary approximating 15 miles from the beach in the Norton Sound section, to protect a long established winter subsistence fishery.
- 3) 5AAC 34.925 (i) and (j), requiring pot tags and limiting vessels of 125 feet in length or less to 40 pots each and larger vessels are limited to 50 pots.

This new regulation, 5AAC 34.925, along with a regulation making Norton Sound a superexclusive registration area was responsible for the change in character of the fishery during the 1994 and 1995 seasons. Apparently, many large vessel owners felt their vessel would not be able to compete economically under the new pot limit and exclusivity requirements. Only one Bering Sea crabber participated in the 1995 fishery.

The 1995 summer commercial red king crab fishery opened at 12 noon, July 1 in the Norton Sound Section. An emergency order relaxed the closure line northward to 64°20' north latitude and eastward to 161°15' west longitude effective 12:00 noon July 1. Regulation 5AAC 34.935 (CLOSED WATERS) also allows the department the flexibility to reduce the closed waters area to allow an efficient harvest of red king crab during the summer fishery.

A pot survey completed June 26 through June 28 in the Nome area indicated the center of abundance of the red king crab stock in the deep water from Cape Nome east, five to ten miles offshore. Therefore

the closure line was moved northward and set along the outer edge of that concentration. A pre-season pot survey was initiated this year to survey the abundance of legal and sublegal king crab in the eastern Norton Sound area. This cooperative survey, conducted by private industry and the department, was also useful in determining where the closed water boundary would be placed.

Residents in eastern Norton Sound requested that commercial fishing be allowed in areas accessible to their villages. Another emergency order relaxed the closure line eastward to 166°30' west longitude, and no closer than three miles to mean high water effective 12:00 noon, July 15.

An interest was expressed by processors and fishermen to fish the northwestern portion of the Norton Sound Section. This portion of the section has never had a summer commercial fishing effort and there has been no survey of the area to assess the crab resource. The Department required all fishermen intending to fish in this area to complete a catch reporting log.

The fishery was extended by emergency order due to poor weather and closed 12 noon, September 5, 1995.

A total of 53 catcher vessels were registered for the summer commercial crab season. Forty-eight vessels actually made deliveries and 81 permits were fished. There were two land based processors that took part in the fishery. Catch reporting logs were kept by buyers and skippers of catcher vessels for each statistical area fished. Buyer verbal reports were relayed daily by 9:00 a.m. to the ADF&G office in Nome. Fish tickets were due in to the ADF&G office at the end of each week. Vessel reports from fishermen and Catcher/Seller fish tickets were required every Monday for the duration of the fishery. Compliance with reporting requirements was good. Daily catch statistics can be found in Table 1.

This was the second commercial summer crab season during which a significant portion of the harvest was processed in Nome. Three companies bought crab at Nome, but all had their crab processed at the same processing plant in Nome. Approximately 98% percent of the harvest were processed in Nome.

The total commercial catch was 105,967 crab. A total of 322,676 pounds were harvested. Thirty-three percent of the harvest was captured in stat area 646401, 21% in area 646402, 14% in area 656402, 10% in area 656401, 7% in area 636401, 6% in area 656330 and 626401. The remaining 3% of the harvest was caught in areas 666431, 666330, 646330, 646301, 636402, and 616401. Total harvest for individual stat areas can be found in Table 2.

The overall CPUE for the 1995 fishery was 5.6 crab/pot. Stat area 626401 had the greatest CPUE with 23.2 crab/pot (Table 2). The CPUE for area 646301 was 19.3 crab/pot, 17.8 crab/pot for area 636401, 17.5 crab/pot for area 636402, 11 crab/pot for area 656330, 8.7 crab/pot for area 666431, and 5.3 crab/pot for area 666330. The CPUE in stat areas 646402, 646401, 646330, 656401, 656402, 616401 were all less than 5 crab/pot.

Fish ticket reports document that 13 statistical areas were fished (Table 2). A total of 18,782 pot lifts occurred during the fishery. Thirty-eight percent of all pot lifts occurred in stat area 646401, 24% in area 646402, 17% in area 656402, 12% in area 656401, 3% in area 656330, 2% in area 636401 and

626401. Less than 2% of all pot pulls occurred in areas 666431, 666330, 646330, 646301, 636402, and 616401.

CPUE most graphically demonstrates the eastward shift in the Norton Sound king crab population. Fifteen percent of the harvest occurred just south of Golovin in statistical areas 626401, 636401, and 636402 (Table 2). This area accounted for less than 5% of all pot lifts and only four vessels fished there. The CPUE in the waters offshore of Golovin were over three times greater than the average. Fishing in this area occurred only near the end of the season; therefore, a larger percent of the harvest may have occurred there if fishermen had moved to the area sooner.

Based on fish ticket data, statistical area 626401 had the greatest CPUE of 23.2 crab/pot (Table 2). Overall CPUE for the 1995 season was 5.6 crab/pot. Appendix Tables 2 and 3 equate previous commercial crab harvest, effort, CPUE and value to the 1995 season. During the 1995 fishery, there were approximately 1,900 pots on the fishing grounds. Therefore, the CPUE in years with a similar number of pots deployed on the grounds are compared to the overall CPUE in 1995: 9.3 crab/pot in 1994; 4.3 crab/pot in 1992; 19 crab/pot in 1990; 10 crab/pot in 1987; 11 crab/pot in 1985; and 14 crab/pot in 1984 (Appendix Tables 2 and 3).

There was no floating processors or catcher processors operating in Norton Sound during the 1995 summer fishery, therefore no independent observer was placed on board commercial vessels. One ADG&G employee was stationed in Nome to monitor the fishery, act as onboard observer/sampler on catcher vessels and sample legal crab on vessels that delivered to buyers in Nome. This was the only means of collecting essential biological data from the sublegal portion of the population. The observer also provided a means to enforce size and sex restriction regulations that protect the resource. Catcher vessels are not required to have observers onboard, but may choose to allow an ADF&G observer onboard to collect data.

The ADF&G observer was able to monitor pot lifts on three different occasions in 2 statistical areas. Legal male crab made up 72% of the observed catch in area 656402, and 55% of the observed catch in area 646402 (Table 11).

Pre-season Pot Survey

On June 26, pots were set in a series of 15 transects evenly spaced between the longitudes of 166°13' and 164°28'(Figure 9). Pots were set in these transects beginning at the 64°10' latitude line and ran north. Pots were dropped at an interval of approximately one nautical mile. An ADF&G observer was placed on board each vessel participating in the pre-season pot survey on June 28. Species, sex, biological length, legal size, shell age, and ovigerity of all king crab in each pot pulled was recorded. One hundred crab were kept for research and the remainder of the catch was returned to the sea.

There were a total of 1,185 legal red king crab, 722 sublegal male red king crab, and 24 female red king crab captured in all pot pulls during the pre-season survey. The length frequency distribution of all male crab captured was: 38% prerecruit crab, 20% recruit crab, and 42% postrecruit. Only 2 female blue king crab were captured in all pots pulled. Figures 5 and 6 show recruit, prerecruit and postrecruit crab

from the 1995 winter crab project (Brennan and LaFlame, 1995) and the summer pot survey. The length frequency distribution of crab captured in both studies are comparable.

Legal male crab with new shell carapace made up 86% of the legal crab sampled, and old shell crab made up 14% (Table 6). Recruit king crab made up 32% of the sample. The mean carapace length for all legal male crab sampled was 120.1 mm. The greatest concentrations of legal crab were found between the longitudes of 165°03' and 164°28', the eastern portion of the sampling area. Ninety-seven percent of the sublegal male crab measured had a new shell carapace.

Commercial Catch Sampling

Carapace length measurement and age were collected from 1,174 legal male red king crab throughout the duration of the 1995 summer fishery. Carapace age was classified as new (11 months old) or old (at least 23 months old) (Table 3, Figure 4). Male crab with new shell carapaces made up 79% of the total legal male king crab sampled, while old shell crab made up 21% of the sample (Table 3, Figure 4). Recruit crab made up 36% of all legal male crab sampled. Post recruit crab made up 64% of the legal crab sampled. The overall observed catch of legal crab was 2.5 crab/pot pull.

Carapace length measurement and shell age were collected from 117 sublegal male red king crab (Table 4, Figure 5). Data was collected from two statistical areas. New shell crab made up 97% of the sublegal crab sampled and old shell crab made up 3% (Table 4). The overall observed catch of sublegal male crab was 1.2 crab/pot (Table 11).

Carapace length measurement and percent ovigerity was collected from a total of 42 female red king crab during the commercial fishery (Table 5, Figure 6). Mature female king crab made up 98% of all females sampled. One immature female crab was sampled during the fishery. Ninety percent of the mature female crab sampled were considered to have a high degree of ovigerity (> 60% full clutch).

Enforcement

Good weather allowed for tank inspections and registrations of all vessels. The Fish and Wildlife Protection officer was able to patrol using a chartered vessel 3 times throughout the fishery. Fishermen and buyers were cited for violations including possession of undersize crab (3), fishing in closed waters (5), improperly marked gear (3), and failure to report (2).

Norton Sound Winter Commercial Fishery

Regulation allows a winter commercial fishery in the Norton Sound Section from November 15 through May 15 which typically takes place near Nome. The winter commercial fishery is required to take place from the ice, not from vessels. During the winter of 1993-1994, 25 commercial fishermen reported selling a total of 5,649 red king crab (Table 2). The villages east of Nome reported harvests of crab for the third year in a row. Although ice conditions were unfavorable in the Unalakleet and Shaktoolik area, Elim reported four percent of the harvest and a small harvest was reported from the vicinity of St. Michael. The harvest is split between local residents who buy crab directly from the fishermen and Anchorage and other non local markets. Crab are sold in Nome for six dollars per crab, while in Anchorage the price is approximately \$3.50 per pound, resulting in an average price of \$3.01 per pound for all the commercial product. The 1993-1994 winter catch of 17,214 pounds was estimated to be worth about 51,814 dollars.

The winter crab fishermen generally use crab pots but some use handlines to "prospect". Deploying pot through sea ice is laborious, but hand lines can be dropped through a large ice auger hole in a short period of time. The other advantage of hand lines is that during periods of favorable weather hand lines may be deployed from new, less stable ice without the risk of losing more expensive crab pots. Most fishermen consider commercial crabbing a sideline and hold other jobs. Usually, two or three of the winter crab fishermen sell the majority of the crab. Because the volume of crab involved is low, no processor has found it profitable to operate locally. The crab sold locally are all sold fresh as are those shipped to Anchorage or other non local markets. During the mid-winter months fishermen find it difficult keeping the crab from freezing. Many Nome residents prefer to buy frozen crab since they are able to extract the meat prior to cooking. Fresh frozen crab are easily marketed in Nome but are not accepted in Anchorage markets.

SUBSISTENCE FISHERY

Red king crab are utilized by Norton Sound residents mainly during the winter. Fishing occurs through cracks or holes cut in the ice with the use of handlines and pots. In order to document trends in the subsistence harvest, the Board of Fisheries enacted a regulation in 1977 requiring subsistence fishermen in Norton Sound to obtain a permit prior to fishing and to record daily effort and catches on these permits (Table 2).

The first year subsistence permits were required had the highest number of permits issued to date and a relatively high harvest rate were recorded. The fishery declined sharply the following year and remained at very depressed levels throughout the 1981-82 season. The lack of success in the winter crab fishery during some past years has been attributed to a declining crab population caused by the removal of crab in the summer commercial fishery together with low recruitment, low effort due to poor ice conditions, and changes in the nearshore winter distribution of crab. All these factors probably had some effect on the success of the winter fishery in varying degrees. During the 1978-79 winter fishery, the king crab population was still in relatively high abundance. Despite this relatively large population, winter catches were the poorest on record indicating that the major factors limiting winter catches were probably poor

ice conditions and the distribution of crab. During the winter of 1981-82, poor winter catches could more reasonably be attributed to a declining crab population since the crab population was at its lowest documented level. Subsistence fishing success during the winters of 1982-83 through 1986-87 had improved due to a rebuilding of the population and increased use of more efficient gear (pots instead of handlines). Unstable ice conditions and record snowfalls adversely effected the 1987-88, 1988-89, and 1992-93 catches. During years of stable ice conditions, an average of approximately 100 fishermen has averaged 100 crab each per season (Table 2).

The winter crab fishery is limited by extreme weather conditions. Shorefast ice can become unstable where crab pots may be carried away or fishermen are unable to cross open leads to get to their pots. Low air temperatures, wind and drifting snow are the primary factors that determine effort levels rather than crab densities.

STOCK STATUS / RESEARCH

In 1976, when monitoring of the Norton Sound king crab population first began, the population was mainly composed of prerecruit and recruit crab (Figures 4 & 5). The initial population assessment survey by the NMFS estimated the legal male king crab population at 8.1 million pounds. The legal male crab population peaked in 1978 at an estimated 11 million pounds. During the 4 years following 1978, recruitment into the legal male crab population was very low. Subsequent NMFS surveys in 1979 and 1982 documented a population of predominantly postrecruit crab, and estimated the population had declined to 2.6 million pounds by 1982. The Department of Fish and Game conducted their first population assessment survey in 1980, with subsequent surveys in 1981 and 1982 (Table 3). These survey assessments documented a similar decline from 6.6 million pounds (1980) to 1.3 million pounds (1982). Beginning in 1981, sublegal crab abundance began to increase, and by 1983 recruitment into the legal male population also began to increase. No assessment work was conducted in 1983 or 1984. However, samples of the commercial catches have indicated a significant increase of recruit crab into the legal male population; from a historic low of 10% in 1981 to 59% in 1984 (Table 4).

In 1985 both NMFS and ADF&G conducted population assessment surveys in Norton Sound (Table 3, Figure 5). The Department fished 65 stations throughout Norton Sound capturing 4,645 legal males, of which one-third was tagged. Subsequent recapture of tagged crab by the commercial fleet in August of 1985 provided tag to untagged ratios, employed to estimate the population prior to the fishery at 2.4 million pounds (Table 3). After the commercial fishery in 1985, NMFS conducted a population assessment survey using trawl gear over a slightly larger area than that surveyed by the Department. Male king crab sampled in NMFS trawls were in the process of or had just molted with the result being that their estimate of 3.4 million pounds of legal male king crab included some recruitment. Adjusting this estimate for molting, and including the summer commercial harvest, an estimate of 3 million pounds present prior to the 1985 August fishery was developed. Both surveys documented relatively substantial numbers of recruit crab and a healthy percentage of prerecruit crab.

During September of 1988 NMFS conducted a fourth population assessment with trawl gear. They sampled an area roughly the same size as in 1985, but increased sampling frequency in the proposed

mineral lease area near Nome. The timing of the study, which occurred during the male molt, was almost a month earlier than similar surveys in the past. Nearly all the 1988 catch was in pre-molt condition. NMFS estimated 3.0 million pounds of legal male and 1.0 million pounds of prerecruit-one male red king crab; totaling 4.0 million pounds. Annual mortality was estimated at approximately 20% or 0.8 million pounds. Ignoring growth and the winter harvests, the population prior to the 1989 summer fishery would have been 3.2 million pounds, very close to the 1985 trawl estimate of 3.4 million pounds.

NMFS conducted a fifth trawl survey of Norton Sound during late August 1991 with a reduced number of tows. Each station had only a single sampling tow as compared to each station having both a day and night tows during previous surveys. This reduction in sampling had the effect of introducing more variability into the estimate. The legal crab biomass in the summer fishing area was estimated to be 3,400,000 pounds and the total Norton Sound legal biomass was estimated to be 4,009,000 pounds. Since the survey occurred prior to the molt, a mortality of 10% was assumed for the year following the estimate. With no summer or winter fishery data to compare with the survey results, a conservative biomass of 3,400,000 pounds was used as the basis for the 1994 harvest guideline. The Norton Sound red king crab population was thought to be stable with harvest set near 10%.

In-season sampling during the 1994 summer commercial fishery showed the lowest rate of recruitment of legal males since 1983 when data collection began. The incidence of skipped molts was double that of the long term average. Although no changes in the female indices were noted, that data base is less extensive. It appeared that recruitment did not keep pace with harvest and natural mortality during the 1993-94 season. The Norton Sound population has been considered to be depressed and rebuilding since 1983. The department's goal is the rebuilding trend should be sustained. The poor recruitment discovered during the 1994 season precipitated the pot survey the following winter and the 1995 preseason survey. Both studies found strong recruitment during the fall of 1994.

A small pot survey was conducted in the vicinity of King Island from June 21 to June 24. The survey was intended to document the variety of crab present in the closed waters surrounding the remote island. There was very little crab population data on this area. The study was undertaken to gather information for the proposed regulation change that is presently before the Board. Several fishermen offered to transport an observer, drop and run two strings of 20 pots, soaking them one day. Two vessels were chosen to assist with the data collection, fishing proceeded with the understanding all crab would be returned to the sea. All the king crab that were captured in the survey were blue king crab and the center of abundance seemed to be four miles east of the island. There were very few caught west of the island and the study indicates crab are present in open waters within the Norton Sound Section.

FUTURE INVESTIGATIONS

Norton Sound has been included in a king crab studies budget increment passed by the legislature. Both funding for a sustained winter program and a triennial trawl survey to evaluate Norton Sound crab populations are part of that proposal. A winter pot survey is planned for the late winter months of 1996 and a trawl survey to generate a population estimate is planned for August of 1996.

Once again it may be possible to conduct pre-season pot surveys of the likely commercial fishing area or the waters east of King Island. These surveys could be used to verify the presence and relative abundance of crab, direct fishing away from sublegal portions of the population and to anticipate fishing patterns.

OUTLOOK FOR 1996

The outlook for 1996 is one of status quo. The low level of recruitment suggested from the analysis of samples collected during the 1994 summer season is always a possibility, but the Norton Sound king crab stock has not seen recruitment failures lasting multiple years. The population is thought to be gradually increasing in number and so the current exploitation rate will be maintained. The guideline harvest for the 1996 summer season will be 340,000 pounds.

Table 21. Commercial harvest of red king crab from Norton Sound Section by statistical area, Northern Bering Sea District, 1995 (summer fishery only).

Statistical Area	# Vessels	Total Harvest Number	Total Harvest Pounds	Total Pots Lifted	Average Crab/Pot	Average Weight
616401	3	11	35	43	0.3	3.18
626401	3	6,593	18,971	284	23.2	2.88
636401	4	8,060	24,329	454	17.8	3.02
636402	2	995	3,466	57	17.5	3.48
646301	1	1,542	4,628	80	19.3	3.00
646330	2	441	1,493	100	4.4	3.39
646401	55	34,798	105,045	7,164	4.9	3.02
646402	47	22,157	66,821	4,562	4.9	3.02
656330	9	6,012	19,745	545	11.0	3.28
656401	38	10,312	32,289	2,294	4.5	3.13
656402	36	14,488	44,000	3,119	4.6	3.04
666330	1	210	730	40	5.3	3.48
666431	1	348	1,124	40	8.7	3.23
Totals		105,967	322,676	18,782	5.6	3.05

Table 22. Winter 1994-95 subsistence red king crab catches and effort by gear type, Norton Sound area.^a

Gear Type	# Permits Fished	# Males Caught	# Males Kept	# Females Caught	# Females Kept	Total Crab Captured	Total Crab Kept	Average Harvest per Fisherman
Pots	76	6,272	4,717	803	205	7,075	4,922	65
Handlines	9	106	93	22	15	128	108	12
Both	7	448	337	48	2	496	339	48
Unknown	5	73	57	5	0	78	57	11
Totals	97	6,899	5,204	878	222	7,777	5,426	56

^a A total of 166 permits issued. As of 12/14/95, 131 permits returned; 35 permits not returned.

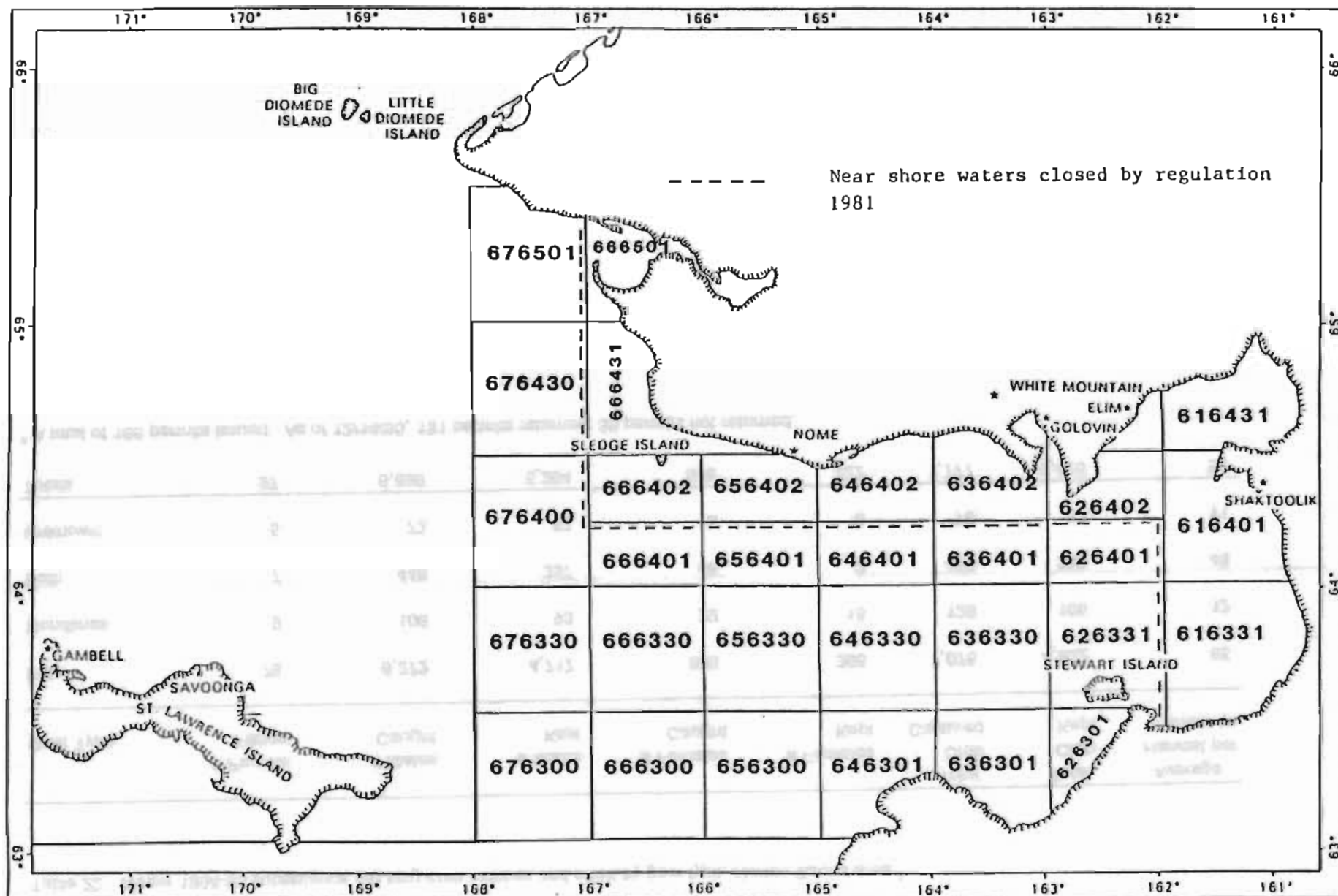


Figure 16 . Statistical areas for the Norton Sound red king crab fishery.

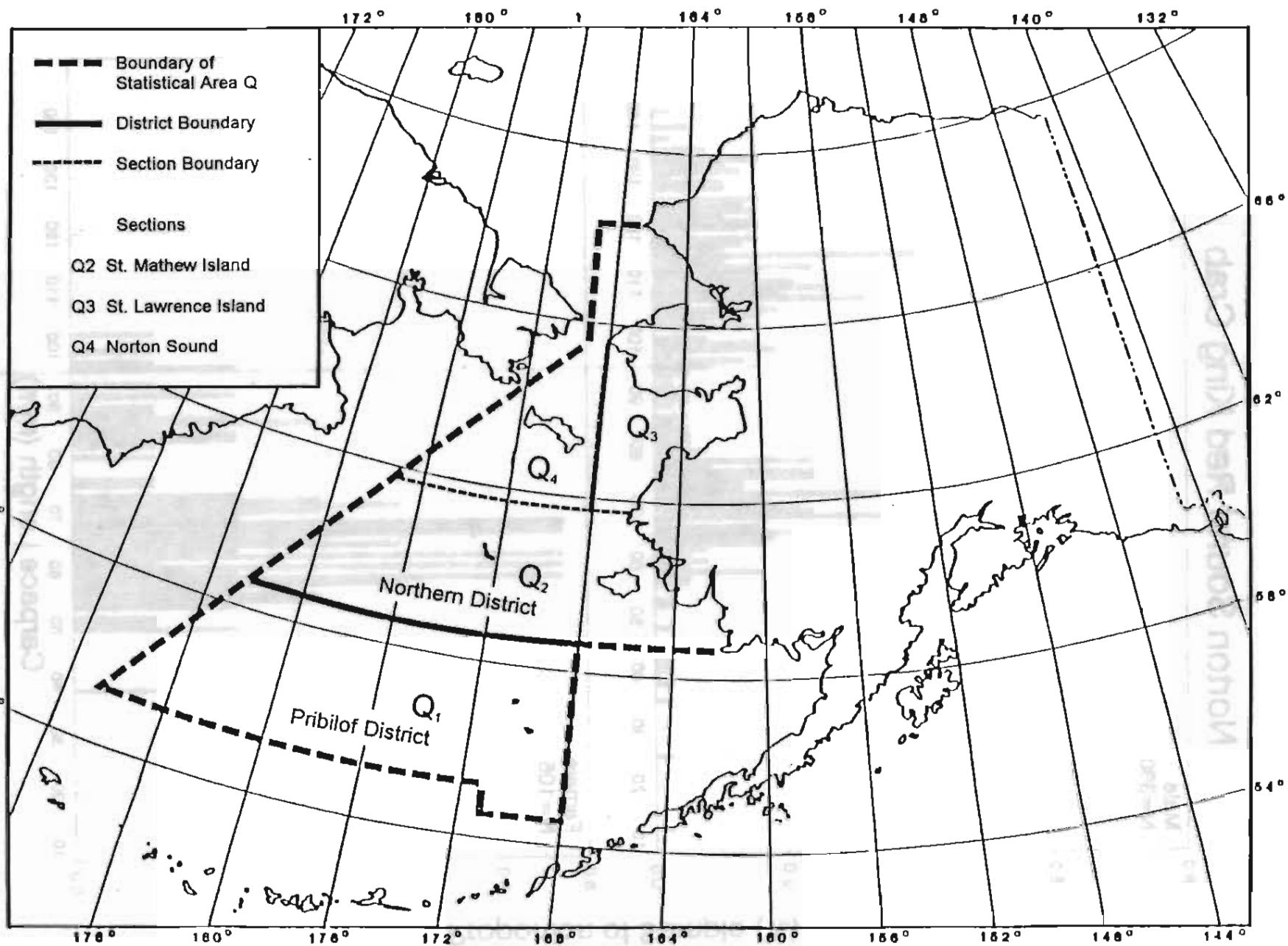


Figure 17. King crab fishing districts and sections of Statistical Area Q

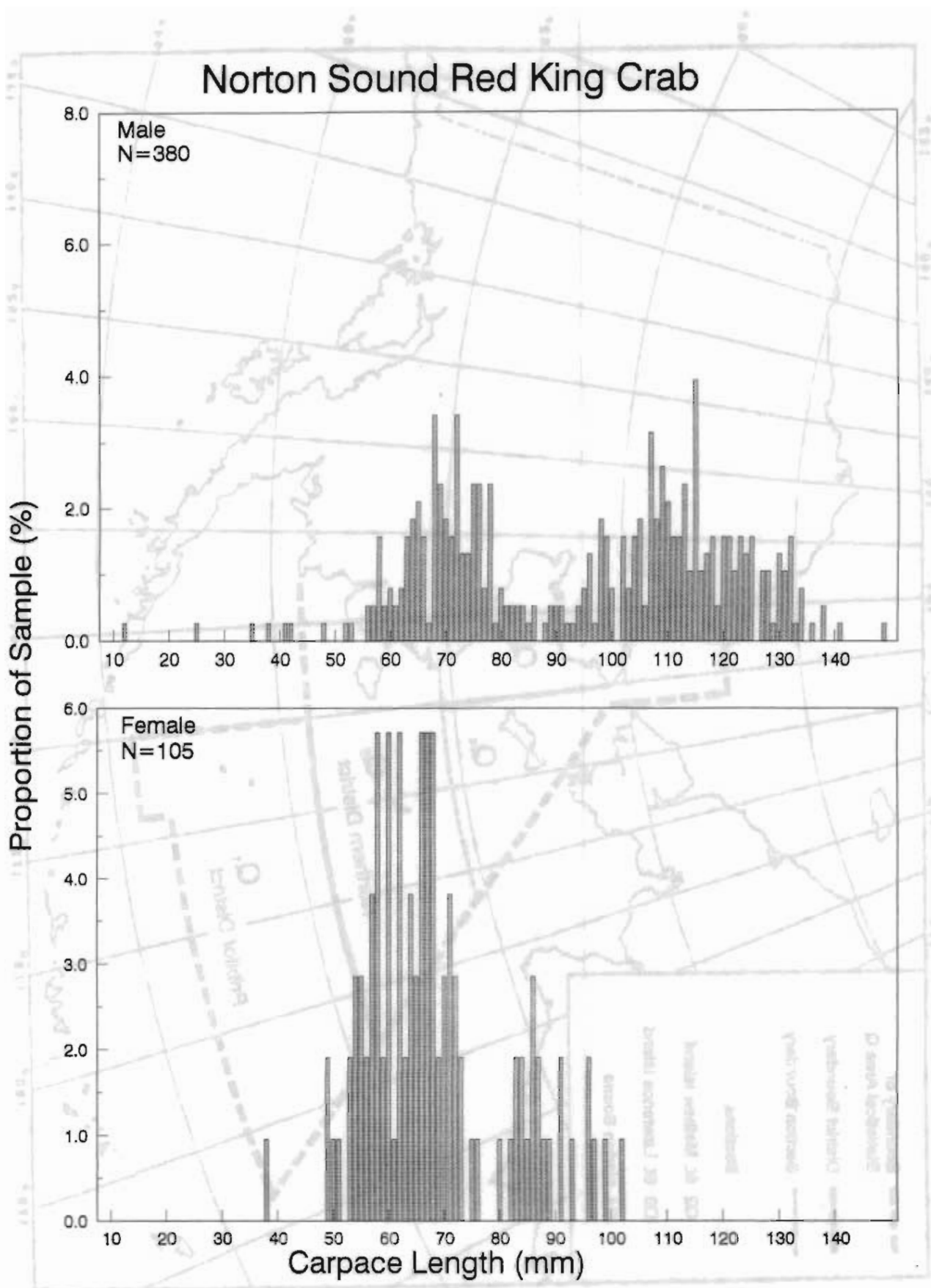


Figure 18. Norton Sound male and female red king crab size distribution from a trawl assessment survey conducted by the National Marine Fisheries Service, 1991.

Norton Sound Red King Crab

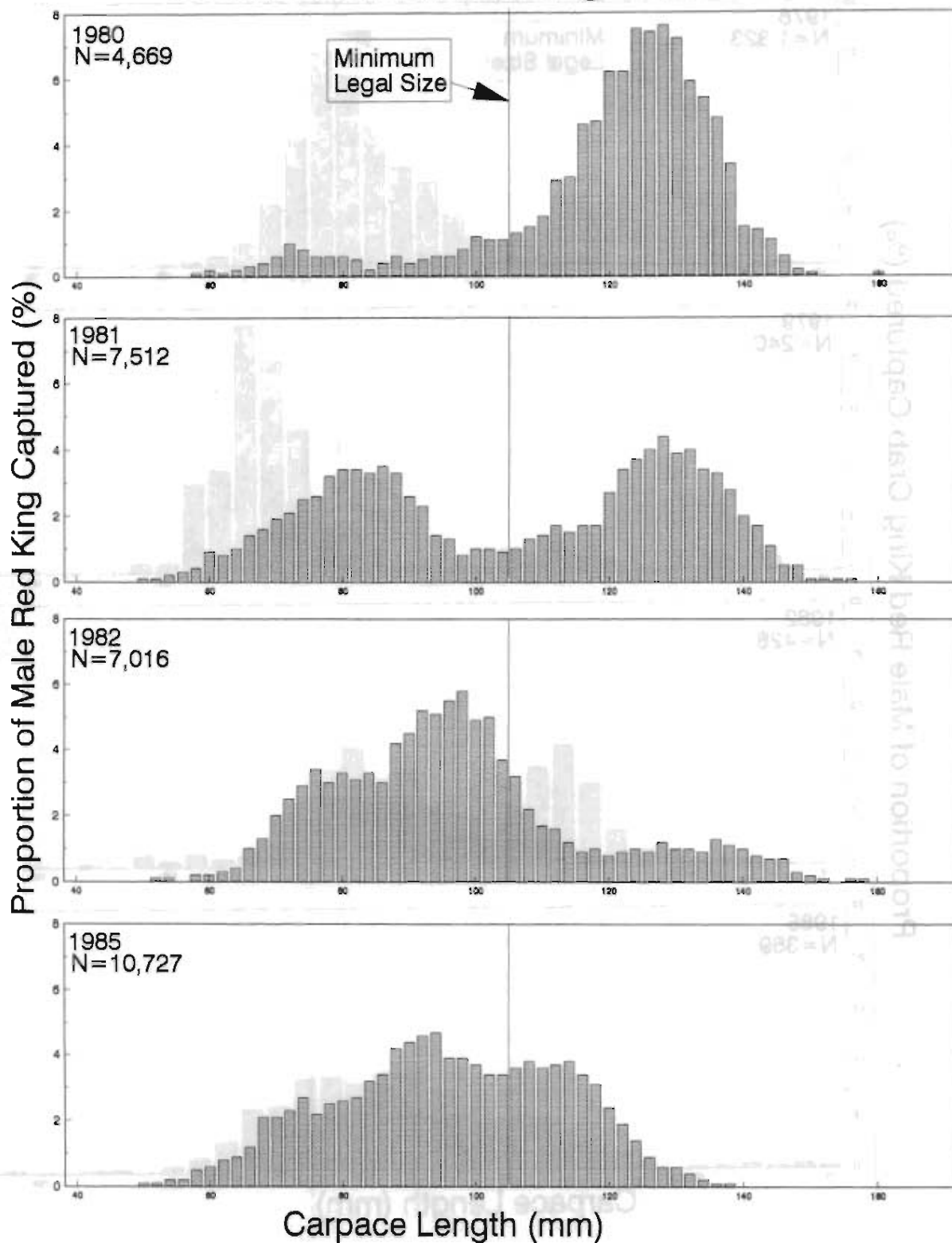


Figure 19. Norton Sound male red king crab size distribution from pot assessment surveys conducted by the Alaska Department of Fish and Game, 1980, 1981, 1982, and 1985.

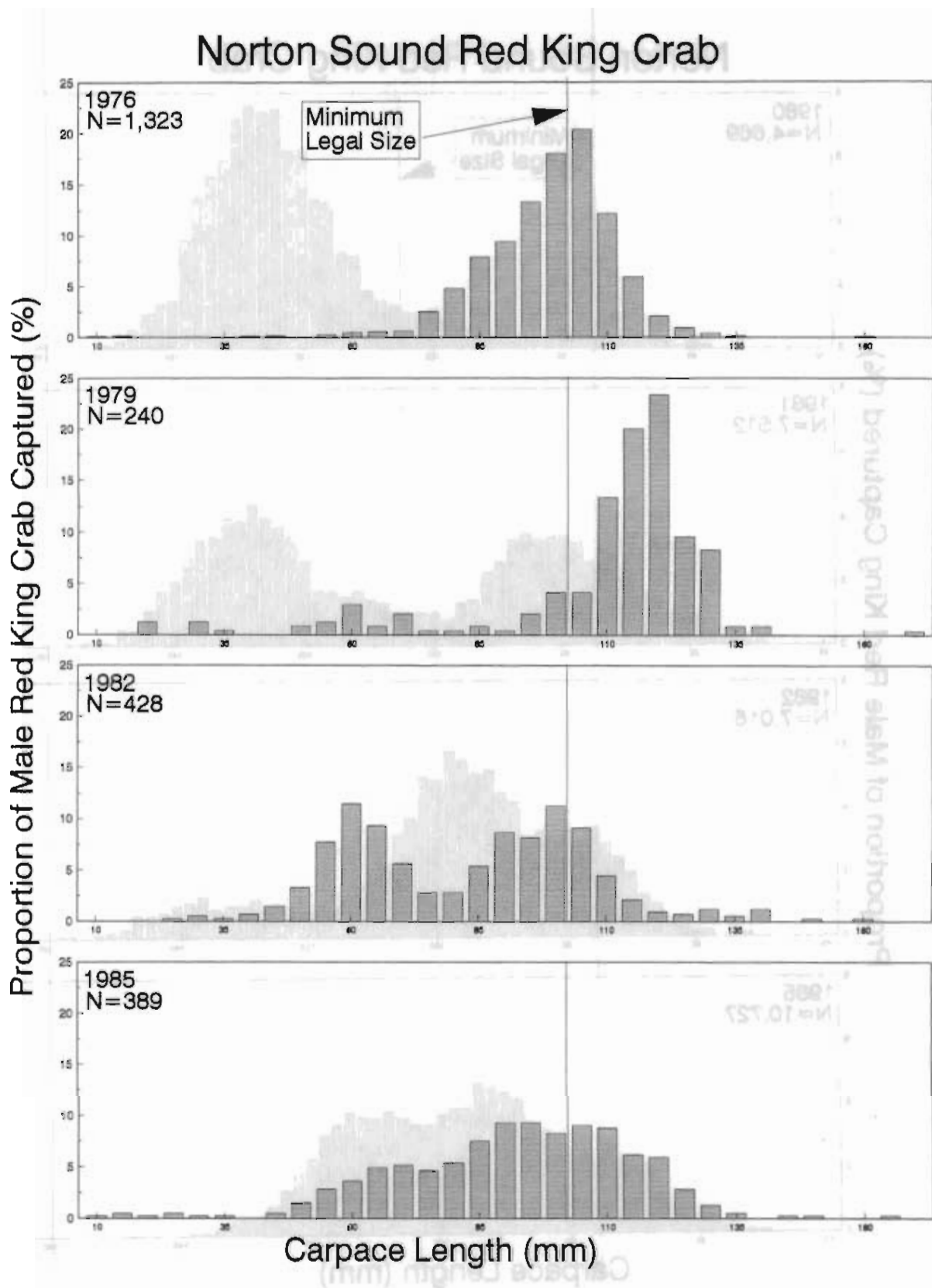


Figure 20. Norton Sound male red king crab size distribution from trawl assessment surveys conducted by the National Marine Fisheries Service, 1976, 1979, 1982, 1985, 1988, and 1991.

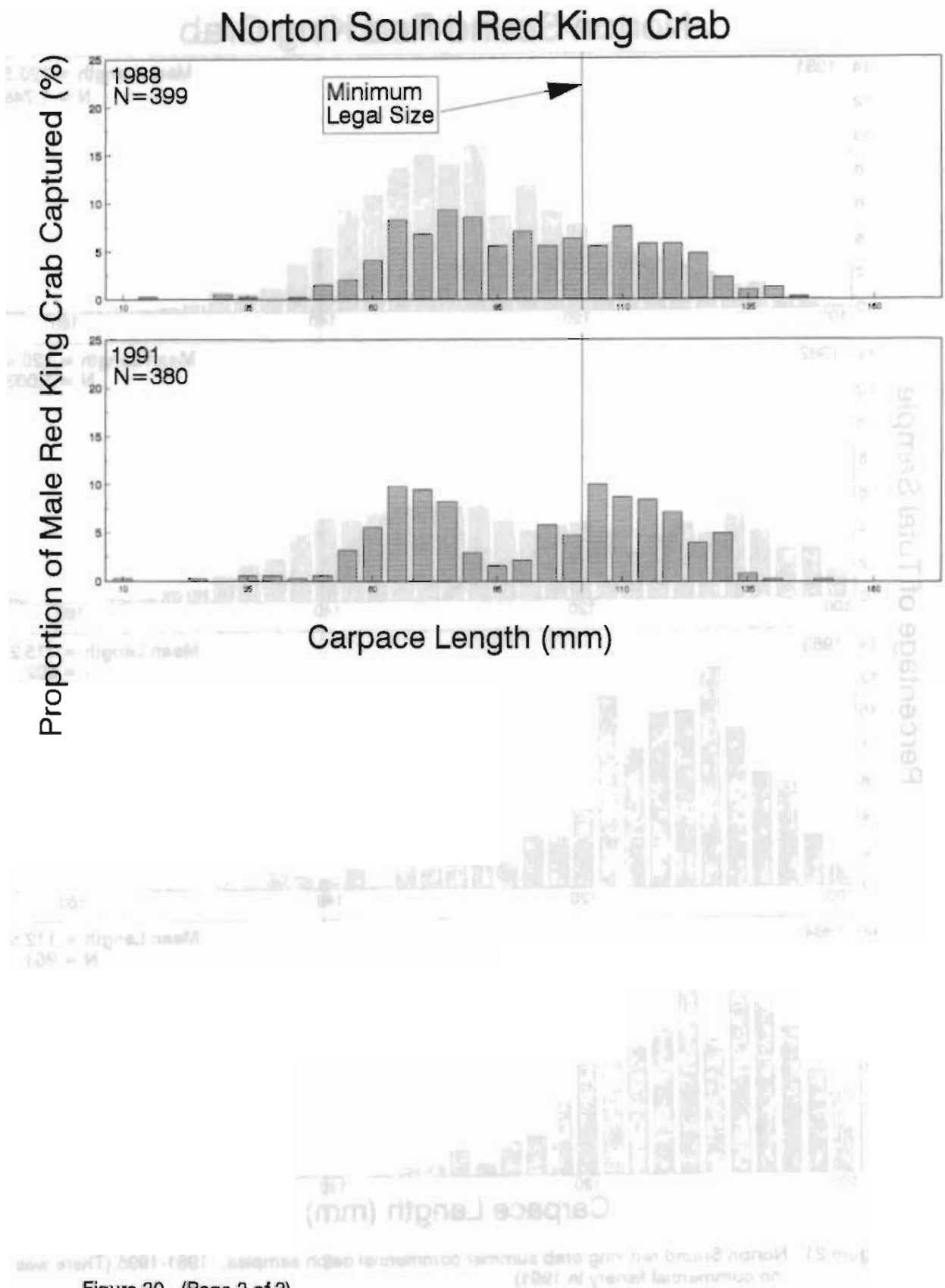


Figure 20. (Page 2 of 2)

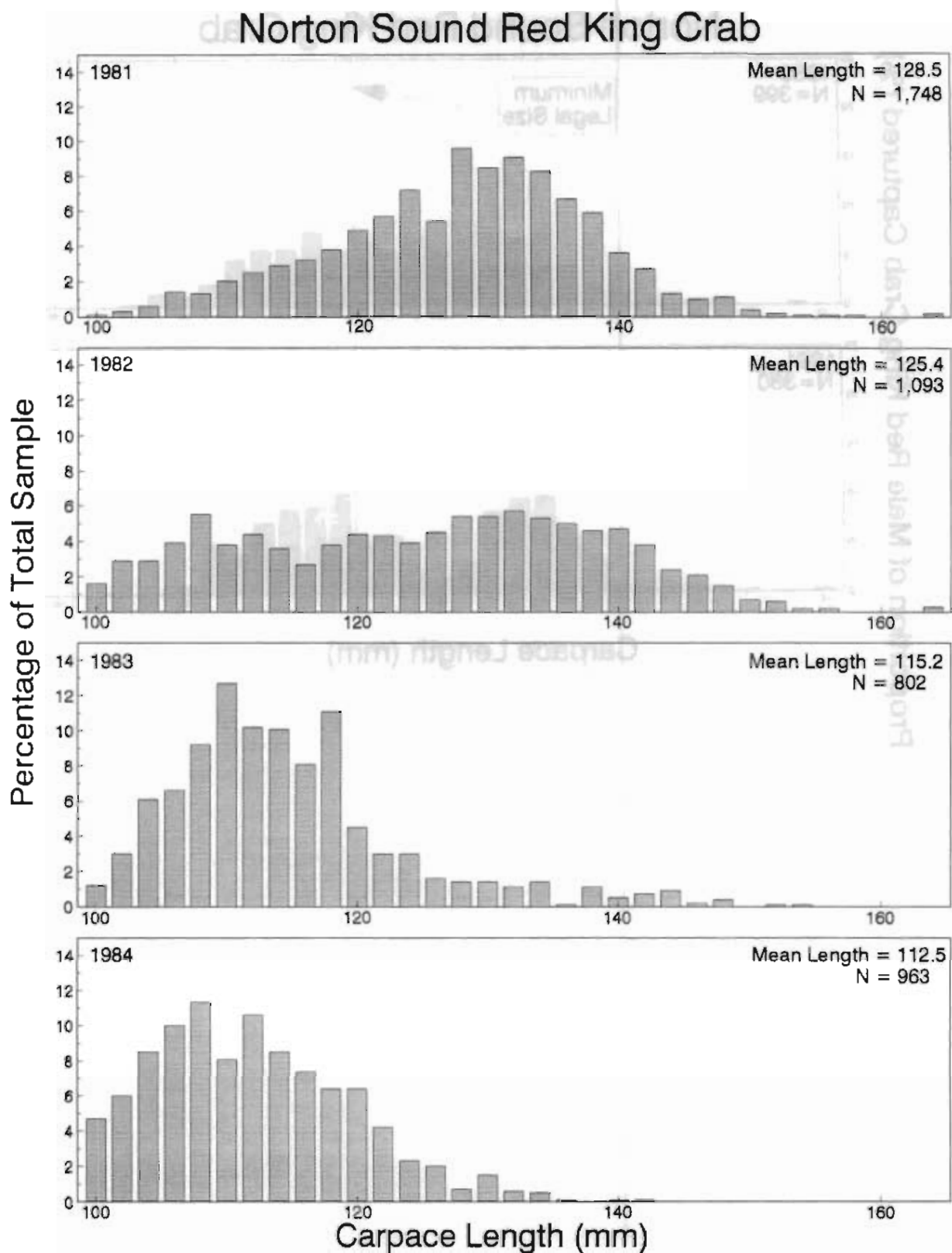


Figure 21. Norton Sound red king crab summer commercial catch samples, 1981-1995 (There was no commercial fishery in 1991).

Norton Sound Red King Crab

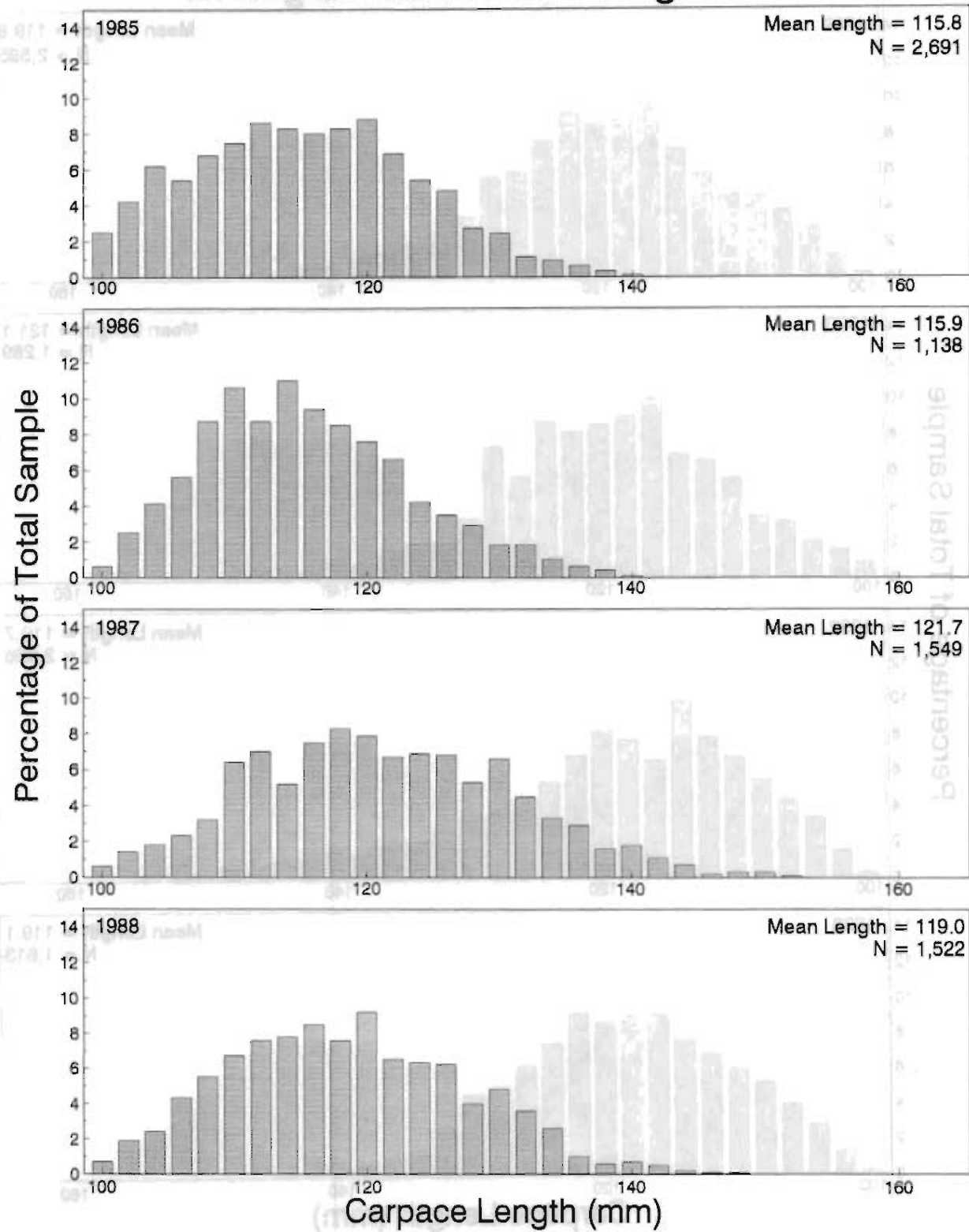


Figure 21. (page 2 of 4)

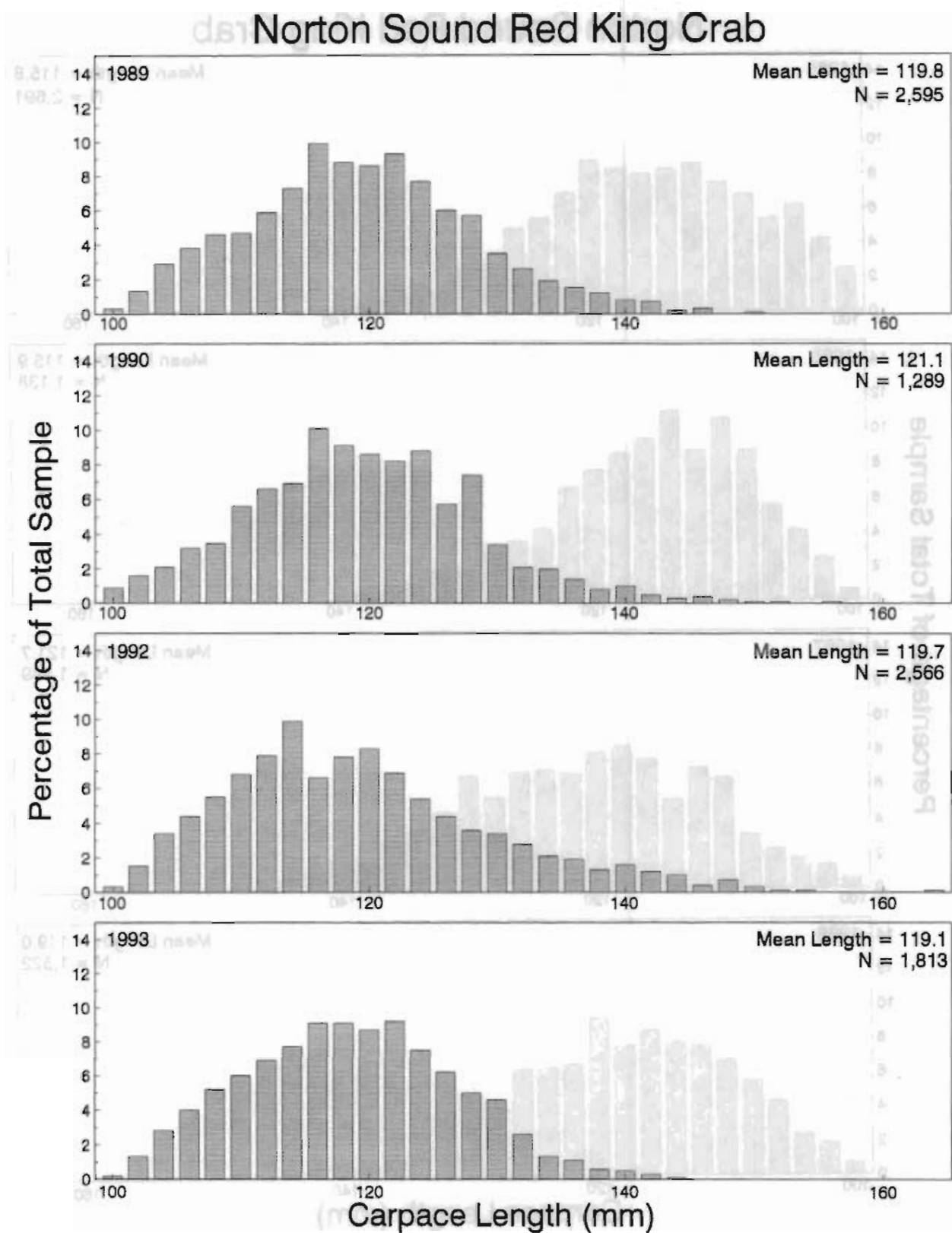


Figure 21. (page 3 of 4)

Norton Sound Red King Crab

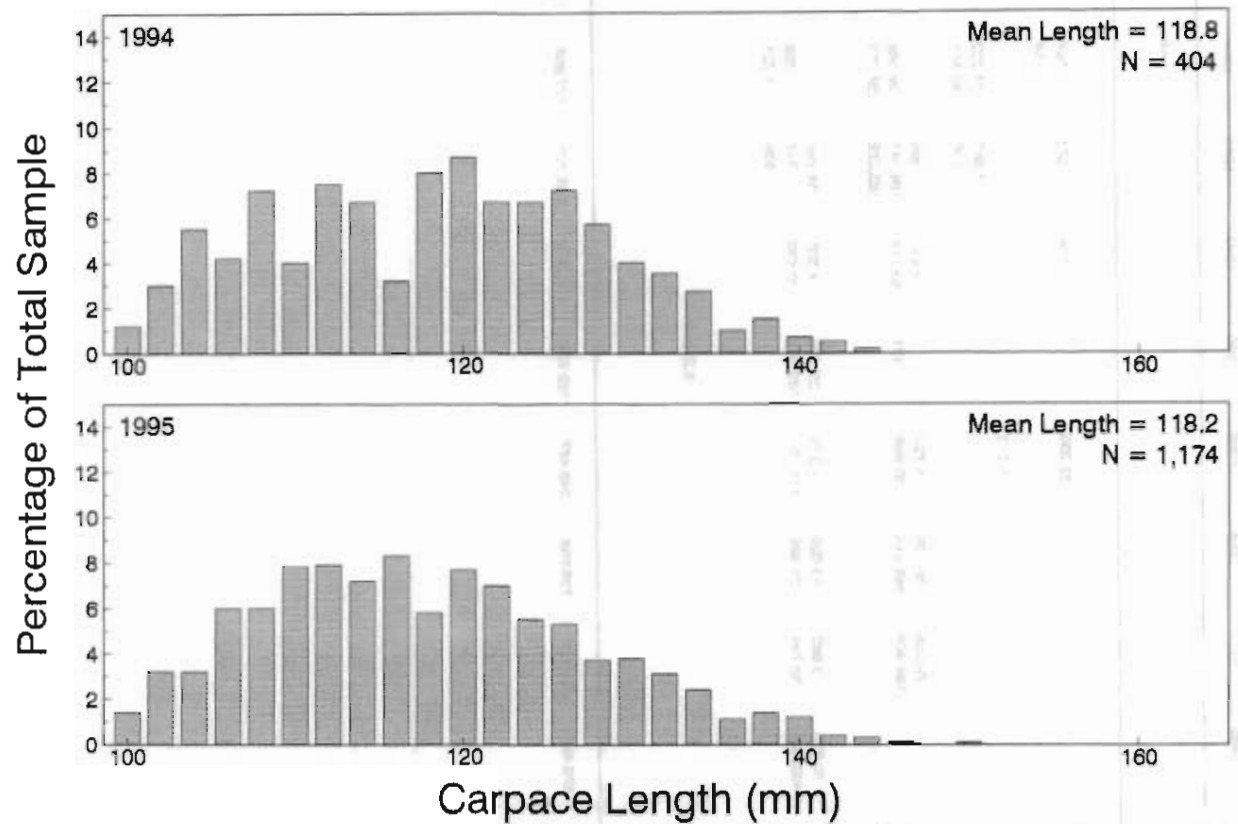


Figure 21. (page 4 of 4)

Appendix Table E1. Comparison of annual summer commercial harvest of red king crab from Norton Sound Section, Eastern Bering Sea, by statistical areas, 1977-1995 (catch in pounds) *

Statistical Area	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1994	1995	Totals
616331	7,693																48		7,841
616401																		35	35
626331	40,020					22													40,042
626401	31,572			4,830	399													18,971	55,772
626402	38,995																		38,995
636401				12,398	61,823	32,246	5,880	41	891				22,030		1,159	1,373	8,067	24,329	170,257
636402																	1,754	3,488	5,220
646301																		4,628	4,628
646330					4,716								5,212					1,493	11,421
646401			155,972		1,319	17,532										1,963	37,222	105,045	310,053
646402	80,969					748										730	143,511	66,821	292,779
656300			181,899		15,174														176,873
656330			323,518	72,735	395,662	3,983	24,246	63,479	7,632		79,008	36,129	1,757		4,814	265		19,745	1,052,971
656401			138,011	121,147	253,387	60,480	11,422	183,119	246,200		194,408	165,644	100,956	171	53,119	105,341	29,566	32,289	1,685,260
656402	308,302	90,187	288,869	918	3,098	2,832			132,363							193,079	106,053	44,000	1,167,701
666230		55,490			77														55,567
666300		162,795	60,816	84,874	8,167	95		4,534											322,281
666330		353,016	505,050	367,446	141,513	8,990	1,192		389	70,615	2,963	13,020	1,275	27,185	4,305	31,758		730	1,529,447
666401		179,212	486,947	205,400	381,510	79,580	325,045	116,254	5,341	406,848	50,744	21,695	115,257	162,263	10,632	746	396		2,550,070
666402	12,036	515,778	534,938	183,581		17,565			32,902							535	1,221		1,298,668
666431			146,029															1,124	147,153
676300		13,238		126,231															139,469
676330		51,304	81,796	6,762	18,734														158,598
676400		667,130	33,856	274	92,026	1,315	247		32					3,212					788,092
676430		3,811	12,309	-0-	373	3,513			1,171										21,177
676501					36														36
686330			1,660																1,660
Totals	517,787	2,091,961	2,931,672	1,186,596	1,379,014	226,821	368,032	387,427	427,011	479,463	327,121	236,688	246,487	192,831	74,029	335,790	327,858	322,876	11,738,888

Appendix Table E2.

Percent recruit and postrecruit size male red king crab from commercial catch samples by year, Norton Sound Section, Bering Sea.

Year	Recruits ^a	Postrecruits ^b
1977	53	47
1978	29	71
1979	33	67
1980	15	85
1981	10	90
1982	27	73
1983	55	45
1984	59	41
1985	45	55
1986	49	51
1987	22	78
1988	25	75
1989	23	77
1990	21	79
1991 ^c	-	-
1992	28	72
1993	31	69
1994	20	80
1995	36	64

^a Percent Recruits = All new shell, legal size, male king crab of carapace length <116mm.

^b Percent Postrecruits = All other, legal size, male king crab.

^c No Summer Commercial Fishery in 1991.

Appendix Table E3. Historic summer commercial red king crab economic performance, Norton Sound Section, Bering Sea, 1977 - 1995.

Year	Guideline Harvest Level (lbs) ^a	Legal Male Pop. Est. (lbs) ^b	Commercial Harvest (lbs) ^{a,b}	Number of			Number of Pots		Exvessel Price/lb	Fishery Value (millions \$)	Season Length	
				Vessels	Permits	Landings	Registered	Pulls			Days	Dates
1977	^d	10.0	0.52	7	7	13	^d	5,457	0.75	0.229	60	^d
1978	3.00	11.0	2.09	8	8	54	^d	10,817	0.95	1.897	60	6/7-8/15
1979	3.00	5.4	2.93	34	34	76	^d	34,773	0.75	1.878	16	7/15-7/31
1980	1.00	6.6	1.19	9	9	50	^d	11,199	0.75	0.890	16	7/15-7/31
1981	2.50	4.7	1.38	36	36	108	^d	33,745	0.85	1.172	38	7/15-8/22
1982	0.50	1.3	0.23	11	11	33	^d	11,230	2.00	0.405	23	8/9-9/1
1983	0.30	2.1	0.37	23	23	26	3,583	11,195	1.50	0.537	3.8	8/1-8/5
1984	0.40	2.7	0.39	8	8	21	1,245	9,706	1.02	0.395	13.6	8/1-8/15
1985	0.45	2.4	0.43	6	6	72	1,116	13,209	1.00	0.427	21.7	8/1-8/23
1986	0.42	2.8	0.48	3	3	^d	578	4,284	1.25	0.600	13	8/1-8/25 ^e
1987	0.40	2.2	0.33	9	9	^d	1,430	10,258	1.50	0.491	11	8/1-8/12
1988	0.20	3.2	0.24	2	2	^d	360	2,350	^d	^d	9.9	8/1-8/11
1989	0.20	3.2	0.25	10	10	^d	2,555	5,149	3.00	0.739	3	8/1-8/4
1990	0.20	3.2	0.19	4	4	^d	1,388	3,172	^d	^d	4	8/1-8/5
1991	^c 0.34	3.4										
1992	0.34	3.4	0.07	27	27	^d	2,635	5,746	1.75	0.130	2	8/1-8/3
1993	0.34	3.4	0.33	14	20	208	560	7,063	1.28	0.430	52	7/1-8/28 ^f
1994	0.34	3.4	0.32	34	52	407	1,360	11,729	2.02	0.646	31	7/1-7/31
1995	0.34	3.4	0.32	48	81	665	1,900	18,782	2.87	0.926	67	7/1-9/5

^a Deadloss included in total.^b Millions of pounds.^c No summer commercial fishery.^d Information not available.^e Fishing actually began 8/12.^f Fishing actually began 7/8.

Appendix Table E4. Winter commercial and subsistence red king crab harvests, Norton Sound, Bering Sea, 1978-1995.

COMMERCIAL			SUBSISTENCE						
Year ^a	Number of Fishermen	# Crab Harvested	Winter ^b	Permits Issued	Permits Returned	Permits Fished	Total Crab Captured ^c	Total Crab Harvested ^d	Average Harvest/fm
1978	37	9,625	1977 -78	290	206	149	^e	12,506	84
1979	1	221	1978 -79	48	43	38	^e	224	6
1980	1	22	1979 -80	22	14	9	^e	213	24
1981	0	0	1980 -81	51	39	23	^e	360	16
1982	1	17	1981 -82	101	76	54	^e	1,288	24
1983	5	549	1982 -83	172	106	85	^e	10,432	123
1984	8	856	1983 -84	222	183	143	15,923	11,220	78
1985	9	1,168	1984 -85	203	166	132	10,757	8,377	63
1986	5	2,168	1985 -86	136	133	107	10,751	7,052	66
1987	7	1,040	1986 -87	138	134	98	7,406	5,772	59
1988	10	425	1987 -88	71	58	40	3,573	2,724	68
1989	5	403	1988 -89	139	115	94	7,945	6,126	65
1990	13	3,626	1989 -90	136	118	107	16,635	12,152	114
1991	11	3,800	1990 -91	119	104	79	9,295	7,366	93
1992	13	7,478	1991 -92	158	149	105	15,051	11,736	112
1993	8	1,788	1992 -93	88	79	37	1,193	1,097	30
1994	25	5,753	1993 -94	118	95	71	4,894	4,113	58
1995	42	7,538	1994 -95	166	131	97	7,777	5,426	56

^a Prior to 1985 the winter commercial fishery occurred from January 1 thru April 30; as of March 1985, the winter commercial season was open by regulation from November 15 thru May 15.

^b The winter subsistence fishery occurs during months of two calendar years (as early as December, thru May).

^c The number of crab actually caught; some crab may have been released.

^d The number of crab "Harvested" is the number of crab caught and kept.

^e Data unavailable.

Appendix Table E5. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

Year	Date	Research Agency	Vessel	Gear Effort	Number of Red King Crab Captured ^a			Population Estimates of Legal Male Crab ^c	
					Sublegal Males	Legal Males	Females	Numbers	Pounds
1976	9/02 - 9/05	NMFS	Miller-Freeman	Trawl 158 tows	768	555	180	3,119,800	8,111,480
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl 71 tows	46	194	40	837,241	2,511,723
1980	7/04 - 7/14	ADF&G	Altair	Pots 397 lifts	443	3,290	158	1,900,000	6,600,000 ^d
1981	6/28 - 7/14	ADF&G	Altair	Pots 718 lifts	4,097	3,415	1,933	1,285,195	4,755,221
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots 689 lifts	5,019	2,001	424	353,273	1,271,783
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl 50 tows	322	107	265	970,646	2,620,744
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots 642 lifts	6,086	4,645	181	907,579	2,414,644
1985	9/16 - 10/01	NMFS	Argosy	Trawl 78 tows	266	163	151	1,203,000	3,369,000
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl 82 tows	258	141	218	1,037,000	3,038,000
1991	8/22 - 8/30	NMFS	Ocean Hope	Trawl 53 tows	202	178	105	1,384,000	4,009,000

a Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

b Legal male red king crab were defined as at least 106mm in carapace length for the 1976 NMFS survey; 105mm for the 1979 and 1985 NMFS survey; and at least 121mm in carapace width for all ADF&G surveys.

c Population estimates are valid for the date of the survey, ie either before or after the summer commercial fishery.

d The 1990 estimate has been revised from the original estimate of 13.4 million pounds. The original estimate was thought inaccurate due to under-reporting of recovered tagged crab.

Appendix Table E6. Size composition by percent of red king crab from winter research pots near Nome, Norton Sound, Bering Sea, 1983-1995.^a

Year	SUBLEGAL			LEGAL		
	Prerecruit Twos	Prerecruit Ones	Totals	Recruits	Post-Recruits	Totals
1983	26	38	64	26	10	36
1984	35	31	66	19	16	35
1985	25	45	70	20	10	30
1986	26	35	61	22	17	39
1987	13	31	44	11	45	56
1988 ^b	-	-	-	-	-	-
1989	27	15	42	27	31	58
1990	16	33	49	25	26	51
1991	5	30	35	34	31	65
1992 ^c	-	-	-	-	-	-
1993	3	9	12	17	71	88
1994 ^c	-	-	-	-	-	-
1995	10	11	23 ^d	32	45	77

^a Sublegals = male crab less than 4 3/4" carapace width.

Pre-recruit Ones = Sublegals greater than 89mm in carapace length.

Pre-recruit Twos = Sublegals smaller than 90mm in carapace length.

Legals = male king crab greater than 4 3/4" carapace width.

Recruits = Legal new shell crab smaller than 116mm in carapace length.

Post-recruits = all non-recruit legal males.

^b No data collected in 1988 due to poor ice conditions.

^c No winter crab research study in 1992 or 1994.

DIVISION 4: MISCELLANEOUS SPECIES
(Includes Norton Sound,
Port Clarence and Kotzebue Districts)

Year	Alaska	Other	Total
1880	10	11	21
1881	1	1	2
1882	2	2	4
1883	1	1	2
1884	2	30	32
1885	10	32	42
1886	15	18	33
1887	13	31	44
1888	28	32	60
1889	32	42	74
1890	37	17	54
1891	38	28	66

SECTION 4 - MISCELLANEOUS SPECIES

INTRODUCTION

Several species other than salmon, crab and herring are utilized for commercial and subsistence purposes in the Norton Sound, Port Clarence and Kotzebue Districts. Primary species include inconnu or "sheefish" (Stenodus leucichthys), whitefish (Coregonus laurettae, Coregonus pidschian, Coregonus sardinella, Coregonus nasus, and Prosopium cylindraceum). (Coregonus sp., Prosopium sp.), Dolly Varden (Salvelinus malma) and saffron cod (Eleginus gracilis).

The fish are taken by set gillnets, beach seines, "jigging" through the ice, and rod and reel. Subsistence catches taken during the summer months are normally air dried, while winter catches are stored frozen. Fish are utilized both for human consumption and for dog feed. Fish taken for commercial purposes are mainly sold locally, although some are shipped from the area.

Subsistence harvest of most species is not limited by regulation. Commercial harvest may be prohibited in some freshwater areas, but limited commercial endeavors are allowed in many areas under terms of a permit.

INCONNU (Sheefish)

Introduction

The distribution of inconnu includes the Kobuk-Selawik River drainages, and Hotham Inlet of Kotzebue Sound and some Norton Sound drainages, but the largest populations and harvests occur within the former area (Figure 21). In the Kotzebue Sound area, adult fish migrate to upriver spawning areas after ice breakup and to wintering areas within the Hotham Inlet/Selawik Lake area during October-November. Although inconnu are capable of consecutive spawning, most fish spawn every two to three years. Inconnu mature slowly with males reaching maturity at 5-7 years of age and females at 7-11 years.

The inconnu's spawning and overwintering migration behavior makes them available for harvest by the various fisheries throughout their life cycle, and increases their vulnerability to overharvest. In addition, the inconnu's slow maturation rate increases the time required to restore depleted populations.

During the 1960's, age, sex and length data indicated stocks were being overharvested by the commercial and subsistence fisheries in the Kotzebue district. Consequently, an annual area commercial harvest quota of 25,000 pounds of inconnu was instituted, although subsistence catches remained unrestricted.

Commercial Fishery

Most of the commercial fishing effort occurs near Kotzebue in Hotham Inlet. Fishermen use gillnets ranging from 5 1/2 inch - 7 inch stretched mesh which are set under the ice. Recorded commercial catches have remained relatively small; however, undocumented catches are believed to be significant and therefore, harvest totals should be considered minimum estimates. Restricted markets outside northwestern Alaska limits commercial activity greatly and most individuals who normally participate in the winter commercial fishery also fish for subsistence purposes. During some years, incidentally caught inconnu are also sold by commercial salmon fishermen when there is a market, but only in small amounts. The 1994-1995 directed commercial harvest of sheefish was reported to be 226 fish totaling 2,240 pounds. The average weight per fish was 9.9 pounds, the average price was \$.50 per pound, and the total fishery value was \$1,120 (Appendix Table F1).

Subsistence Fishery

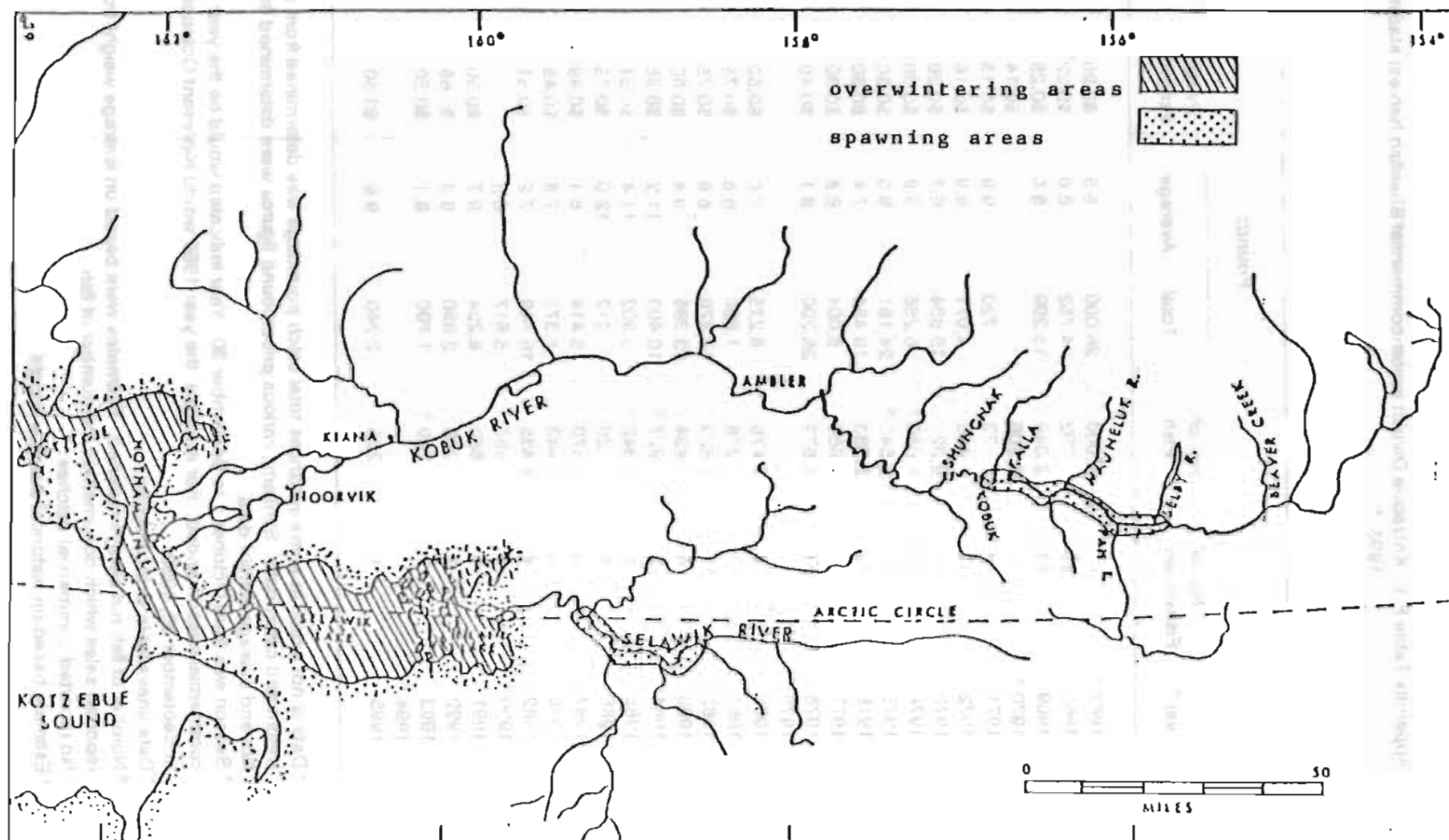
Inconnu have long been utilized for subsistence purposes throughout the Kotzebue Basin. Fishermen along the upper Kobuk River fish for inconnu during June through October, while the lower Kobuk and Selawik River residents fish during April through June. Kotzebue and Selawik fishermen fish in the Hotham Inlet and Selawik Lake during the winter months.

Villages were not surveyed for subsistence sheefish harvest specifically. Appendix Table F2 estimates catches reported during the fall chum salmon subsistence surveys conducted by Subsistence Division, and may include summer as well as winter catches. In 1995, 314 fishermen were interviewed in surrounding villages who reported 9,465 sheefish harvested which averaged out to 25 fish per fishermen. Kotzebue city residents were not interviewed nor were Kobuk Lake gillnet catches.

Escapement

In recent years aerial surveys have been conducted on key inconnu spawning areas incidental to the effort of enumerating salmon. These surveys have primarily been conducted along the upper Kobuk River in September. Survey conditions historically result in either very few or no inconnu being observed (Appendix Table F3). During these surveys, species identification has been a problem in some years. Surveys were not conducted in 1985 through 1990 due to high, turbid water, poor weather conditions, or lack of personnel. Incomplete escapement and catch data provide little basis for assessing the current population status of inconnu in the Kotzebue district, however there is some local concern that the inconnu stocks are declining.

Figure 23. Kotzebue and Kobuk River Valley villages and their spatial relationship with Inconnu spawning and overwintering areas.



Appendix Table F.1. Kotzebue District winter commercial Sheefish harvest statistics, 1967–1995. ^a

Year ^b	No. of Fishermen	No. of Fish	Pounds		Price/Pound	Estimated Value
			Total	Average		
1967 ^c		4,000	26,000	6.5	\$0.20	\$5,200
1968	10	792	4,752	6.0	\$0.22	\$1,045
1969	17	2,340	15,209	6.5	\$0.25	\$3,802
1970 ^c		2,206			\$0.14	
1971	4	73	720	9.9	\$0.13	\$95
1972	5	456	4,071	8.9	\$0.16	\$651
1973	11	2,322	15,604	6.7	\$0.20	\$3,121
1974	6	1,080 ^d	6,265	5.8	\$0.30	\$1,880
1975	^e	2,543 ^d	24,161	9.5	\$0.30	\$7,248
1976	14	2,633	19,484	7.4	\$0.30	\$5,845
1977	2	566	5,004	8.8	\$0.30	\$1,501
1978	11	2,879	26,200	9.1	\$0.40	\$10,480
1979 ^c						
1980	4	1,175	8,225	7.0	\$0.50	\$4,113
1981	1	278	1,836	6.6	\$0.75	\$1,377
1982	11	2,629 ^f	17,376	6.6	\$0.75	\$13,032
1983	8	1,424	13,395	9.4	\$0.50	\$6,698
1984	5	927 ^d	10,403	11.2	\$0.55	\$5,722
1985	4	342 ^d	3,902	11.4	\$0.51	\$1,990
1986	2	26	312	12.0	\$0.75	\$234
1987	3	670	5,414	8.1	\$0.49	\$2,653
1988	3	943	7,373	7.8	\$0.45	\$3,318
1989	8	2,335	16,749	7.2	\$0.51	\$8,542
1990 ^c	6	687	5,617	8.2		
1991	5	852	8,224	9.7	\$0.50	\$4,112
1992	3	289	2,850	9.9	\$0.65	\$1,853
1993	1	210 ^d	1,700	8.1	\$0.50	\$850
1994 ^c						
1995	1	226	2,240	9.9	\$0.50	\$1,120

^a Data is not exact, in some instances total catch poundage was determined from average weight and catch data. Similarly, various price/pound figures were determined from price/fish and average weight data.

^b Season was from October 1 to September 30. Year indicated would be the year the commercial season ended. For example, the year 1980 would represent October 1, 1979 to September 30, 1980.

^c Data unavailable or incomplete.

^d Number of fish not always reported. Estimates were based on average weight from reported sales which documented the number of fish.

^e No reported commercial catches.

^f Estimate based on historical average weight.

Appendix Table F.2. Kotzebue District reported subsistence harvests of sheefish, 1966–1995.^{a,d}

Year	Number of Fishermen Interviewed	Reported Harvest	Average Catch per Fisherman
1966–1967	135	22,400	166
1967–1968	146	31,293	214
1968–1969	144	11,872	82
1970	168	13,928	83
1971	155	13,583	88
1972	79	3,832	49
1973	65	4,883	75
1974	58	1,062	18
1975	69	1,637	24
1976	57	966	17
1977	95	1,810	19
1978	95	1,810	19
1979	75	3,985	53
1980	74	3,117	42
1981	62	6,651	107
5/82–4/83 ^{b,c}	130	4,704	36
5/83–4/84 ^{b,c}	27	764	28
5/84–9/84 ^b	30	2,803	93
1985 ^c	2	60	30
1986 ^{c,e}	72	721	10
1987 ^e	46	276	6
1988 ^e	—	—	—
1989	—	—	—
1990	—	—	—
1991	40	2,180	55
1992	43	2,821	66
1993	46	2,441	53
1994 ^e	171	3,181	19
1995			

^a To obtain individual village catches during years previous to 1982, refer to the 1982 Annual Management Report.

^b Catch by village for these years are presented in separate tables in respective year annual management reports.

^c Summer catches only; winter catches were not documented.

^d Due to limited survey effort during many years, total catch and effort should be regarded as minimum figures only and are not comparable year to year.

^e Villages were not surveyed for subsistence sheefish harvests from 1985 to present; figures shown are catches reported during the fall chum salmon subsistence surveys and may include summer as well as winter harvests.

^f Subsistence sheefish catches not documented.

Appendix Table F.3. Peak annual aerial survey counts of sheefish in the Kobuk and Selawik Rivers, 1966–1995.^a

Year	Kobuk River	Selawik River	Total
05-Sep-66	1,200		1,200
22-Sep-67	1,025		1,025
14-Sep-68	4,973	1,234	6,207
10-Sep-69	3,654		3,654
05-Sep-70	3,220		3,220
30-Aug-71	8,166	1,196	9,362
22-Aug-72	^b		
1973	^c		
21-Aug-74			
24-Aug-75	^b		
02-Sep-76	73		73
1977			
1978	2,824		2,824
12-Sep-79	1,772		1,772
11-Sep-80	250 ^d		250
15-Sep-81	^b		
1982	1,009 ^d		1,009
19-Sep-83	2,604		2,604
05-Sep-84	^c		
1985	^c		
1986	^c		
1987	^c		
1988	^c		
1989	^c		
1990	^c		
1991	17,335		17,335
1992	3,310		3,310
1993	^c		
1994	^c		
1995	1,840		1,840

^a Counts are considered minimal as conditions ranged from poor to good.

^b No fish reported.

^c Not surveyed.

^d Probably more sheefish than listed; species identification problems.

DOLLY VARDEN

Introduction

Dolly Varden (*Salvelinus malma*) are distributed throughout the Norton Sound, Port Clarence, and Kotzebue districts. Although taxonomists have disagreed on the distinguishing Dolly Varden characteristics and distribution of Arctic Char and Dolly Varden, most now agree that char in this area are the northern form of Dolly Varden. In order to eliminate confusion, in this report these fish will be referred to as Dolly Varden, the common name for this species complex.

Dolly Varden in this area are primarily nonconsecutive spawners and spawn throughout the late summer and fall. Fry emerge in the spring and migrate to the ocean during early summer after spending from 1 to 6 (generally 2-5) years in freshwater. Since Dolly Varden are a late-maturing fish (generally age 6-7), they are susceptible to overfishing by commercial, subsistence, and/or sport fisheries. Consequently, commercial fisheries have been maintained at low levels or prohibited to both reduce the potential of overharvest and provide for reproductive and subsistence fishery needs.

Commercial Fishery

Dolly Varden are taken as a non-target species in the directed Kotzebue commercial chum salmon fishery (Tables 9 and 10). Regulation changes in 1976, which closed the commercial salmon fishery on August 31, have reduced the harvest of Dolly Varden since Dolly Varden typically pass through the harvest area during September. Dolly Varden generally appear in commercial catches during the last three weeks of August (Table 19). Reported Dolly Varden catches are dependent upon available markets. The typical season catch when buyers are purchasing Dolly Varden is between 1,000 to 3,000 fish (Appendix Table F4). In 1995, 2,090 Dolly Varden were caught and sold during the commercial salmon fishery. The total weight was 13,195 pounds for a 6.3 pound average per fish and the average price was \$0.20 per pound. (The 1991 commercial harvest was significantly higher at 6,136 due to a high Dolly Varden return with a strong pulse of fish that moved through the fishery during an open period.) Historically two-thirds of the catch is taken on the north side of the district near Sisaulik.

There are several small quota (2,500 pounds) freshwater fisheries in Norton Sound but effort is inconsistent, varying from year to year and stream to stream. During 1995, fishermen from Unalakleet reported harvesting 41 Dolly Varden averaging 1.12 pounds per fish for a total of 46 pounds from the Unalakleet River. The average price was \$0.98 per pound for a total harvest value of \$45.20.

Subsistence Fishery

Dolly Varden are an important component in the diet of subsistence users in the Norton Sound-Kotzebue Sound areas. Subsistence fishermen catch Dolly Varden with seines in the fall, hook and line through the ice in the winter, and gillnets in the spring. The fall seine fishery contributes the greatest number of fish to the annual subsistence Dolly Varden harvest. Since 1962, seine catches made

by the residents of Kivalina, within the Kotzebue District, have ranged from 7,000 to 49,000 Dolly Varden annually (Appendix Table F5)

In the Kotzebue District Fall seine fishing is a group effort with several households comprising a fishing group. The catch is stored and allowed to freeze in willow cribs located near the seining site. These fish are used throughout the winter by the fishing group. It should be pointed out that the historical subsistence Dolly Varden catches that are summarized in Appendix Table F5 are very minimal figures due to the timing of the surveys conducted. Most Dolly Varden harvest take place prior to or just after freeze-up. The village of Noatak usually fishes prior to freeze-up, while the Kobuk River villages of Shungnak and Noorvik fish for Dolly Varden throughout the winter.

Most villagers in the Norton Sound District report incidental catches of Dolly Varden in their subsistence salmon nets. However, the bulk of the catch is taken by seining in the late fall, after Department subsistence surveys had been completed which made it difficult to estimate subsistence catches in the Norton Sound District

Sport Fishery

Residents of the Kotzebue area and nonlocal residents on wilderness boating trips on the Kobuk and Noatak Rivers are the primary participants in the Dolly Varden sport fishery in the Kotzebue area watershed. Approximately 1,500 Dolly Varden are taken in this fishery annually (Sport Fish Division surveys).

Overwintering Counts

Aerial survey counts of overwintering Dolly Varden on the Wulik River have ranged from 297,257 Dolly Varden in 1969 to 30,923 Dolly Varden in 1984 (Appendix Table F6). Weather and water conditions have precluded flying aerial surveys during many years. When weather permits, the Division of Sport Fisheries conduct aerial surveys of the spawning grounds on the Noatak River in the summer and the overwintering areas of the Kivalina and Wulik Rivers in the fall. During the fall of 1995, 128,705 overwintering Dolly Varden were counted on a survey of the Wulik River and 28,870 were counted in the Kivalina River (Sport Fish Division survey). Additional surveys were not conducted on the Noatak and Kivalina Rivers as in previous years.

Appendix Table F.4. Kotzebue District incidental caught and sold Dolly Varden during the commercial salmon fishery, 1966–1995.

Year	Number of Fish Sold	Estimated Total Catch [§]	Pounds Sold	Average Weight	Average Price
1966	3,325	—	—	—	0.55 ^f
1967	367	—	2,606	7.1	0.11
1968	3,181	—	21,949	6.9	0.14
1969	1,089 ^a	—	—	—	2.84 ^f
1970	2,095	—	—	—	—
1971	3,828 ^b	—	23,353	6.1	0.16
1972	7,746	—	56,545	7.3	0.17
1973	640	—	4,608	7.2	0.16
1974	2,605 ^c	—	20,580	7.9	0.16
1975	—	—	—	—	—
1976	—	—	—	—	—
1977	—	—	—	—	—
1978	1,229	—	9,094	7.4	0.15
1979	2,523	—	12,523	5.0	0.25
1980	3,049	—	17,015	5.6	0.20
1981	3 ^e	—	16	5.3	0.17
1982	3,447	—	23,648	6.9	0.20
1983	190 ^e	845	1,108	5.8	0.20
1984	347 ^e	1,090	2,104	6.1	0.25
1985	454	3,600	3,177	7.0	0.25
1986	5 ^e	2,373	34	6.8	0.20
1987	1,261	^h	8,704	6.9	0.30
1988	752	^h	4,967	6.6	0.35
1989	3,093	^h	20,293	6.6	—
1990	604	^h	4,219	7.0	0.25
1991	6,136	^h	40,747	6.6	0.18
1992	1,977	^h	11,951	6.0	0.10
1993	76	^h	540	7.1	0.10
1994	149	^h	767	5.1	0.17
1995	2,090	^h	13,195	6.3	0.20

^a Includes 269 taken by permit.

^b Includes 179 taken by permit.

^c Includes 234 taken during commercial sheefish fishery.

^d Some data extrapolated from average reported weight.

^e Limited Dolly Varden market; many fish taken home or dumped.

^f Price per fish.

[§] Estimate includes fish caught but not soled based on interviews of fishermen.

^h Estimate of Dolly Varden caught (but not sold) not made.

Appendix Table F.5. Subsistence harvests of Dolly Varden from the villages of Kivalina and Noatak, 1959–1995.

Year	Kivalina		Noatak	
	Number	Pounds	Number ^d	
1959 ^a	34,240	85,600	—	
1960 ^a	49,720	124,300	—	
1962	—	—	27,623	
1963	—	—	4,130	
1968	49,512	120,214	— ^c	
1969	64,970	152,750	32,350	
1970	33,820	79,420	3,700	
1971	29,281	68,518	5,320	
1972	48,807	114,637	1,492	
1973 ^b	—	—	—	
1979	14,600 ^c	—	9,060	
1980	—	—	7,220	
1981	15,000–18,000	—	3,056	
1982	18,438 ^e	—	2,676 ^{h,f}	
1983	16,270 ^c	—	4,545	
1984	12,000 ^c	—	2,542	
1985	10,500 ^c	—	— ^g	
1986	7,436 ^c	—	46 ^b	
1987	—	—	1,376 ^b	
1988	—	—	—	
1989	—	—	—	
1990	—	—	—	
1991	—	—	4,814	
1992	—	—	4,395	
1993	—	—	4,275	
1994	—	—	— ^g	
1995	—	—	—	

^a From Saario, Doris J. and Brian Kessel. 1966. Environment of Cape Thompson Region, Alaska. U.S. Atomic Commission.

^b Storm and ice conditions prevented fall harvest.

^c Harvest data from Division of Sport Fish surveys.

^d No data available on poundage.

^e Harvest data from Stephen Braund and Associates.

^f Expanded estimates (see text on subsistence fishery in the 1982 Annual Management Report).

^g Not surveyed.

^h Subsistence fishermen just beginning to beach seine at the time of this survey.

Appendix Table F.6. Aerial survey counts of overwintering and spawning Dolly Varden in the Kotzebue District, 1968–1995. ^a

Year	Overwintering		
	Noatak River Spawner Survey ^b	Wulik River ^c	Kivalina River ^c
1968	—	90,236	27,640
1969	—	297,257	—
1976	—	68,300	12,600
1977 ^d	—	—	—
1978 ^d	—	—	—
1979	—	55,030	15,744
1980	—	113,553	39,692
1981	7,922	101,826	45,355
1982	8,275	65,581	10,932
1983	2,924 ^e	—	—
1984	9,130	30,923	5,474
1985	10,979	—	—
1986	—	5,590	5,030
1987	—	—	—
1988	—	80,000 ^e	—
1989	—	56,384	—
1990	7,261	—	—
1991	9,605	126,985	35,275
1992	—	135,135	—
1993	9,560	144,138	16,534
1994	—	66,752	—
1995	6,500	128,705	28,870

^a Counts are considered minimal as data listed includes both poor and good surveys.

^b Includes spawner count on the Kelly, Kugurorok and Nimiuktuk Rivers, tributaries of the Noatak River.

^c Incomplete survey.

^d Poor weather hampered or prevented survey.

^e Surveys conducted by Division of Sport Fish since 1979.

^f Not surveyed.

WHITEFISH

Introduction

Although inconnu belong to the whitefish family, this section deals with several smaller species of the genera Coregonus and Prosopium. The genus Coregonus contains the "broad" and "humpback" whitefish or C. nasus and C. pidschian, respectively. In addition, three whitefish species known as "ciscoes" belong to this genera; ie., the least cisco (C. sardinella), Arctic cisco (C. autumnalis) and Bering cisco (C. laurettae). "Round" whitefish (Prosopium cylindraceus) are the sole representatives of the genus Prosopium in this area. All species normally spawn in the fall in freshwater.

Whitefish occur throughout most bodies of freshwater in the Norton Sound/Port Clarence/Kotzebue areas and can also be found in inshore marine waters at various times of the year. Whitefish are harvested to a very limited extent by the commercial and sport fisheries within the area, but are uniformly important to the various subsistence fisheries. Recently, there has been increasing interest in commercial development of this resource, especially in the Kotzebue District.

Commercial Fishery

Limited commercial whitefish harvests have been allowed since statehood, normally under the auspices of a permit which delineated harvest levels, open areas, legal gear, etc. Commercial whitefish fisheries have generally been limited to large open water areas (e.g. Grantley Harbor in the Port Clarence District) or ocean waters. Beach seines have been stipulated as legal gear in some instances in order to reduce the number of incidental species taken. Little comparative commercial catch and effort data have been recorded, but harvest levels have historically been low. A majority of the commercial catches have been made in Golovin Bay within the Norton Sound District, in the Kuzitrin River of the Port Clarence District, and in Hotham Inlet and Selawik River in the Kotzebue District. The fish have been sold to local markets for human consumption, dog food, or more recently, crab bait.

In the Kotzebue District, no permit was issued to harvest Fresh water fish during 1995. No whitefish harvest was reported from the Kotzebue District.

Two fishermen from the Port Clarence District reported selling 1,584 pounds of whitefish in three deliveries. The average price was \$0.60 per pound for a total value of \$950.40 for the fishery. The catch was hauled by truck to Nome where it was sold locally.

There was a single delivery 125 fish totaling 184 pounds from Unalakleet in the Norton Sound District which sold for \$0.70 per pound. In the Moses Point Subdistrict of Norton Sound, two permit holders had a combined harvest of 56 whitefish totaling 116 pounds with an average price of \$1.00 per pound. The total Norton Sound harvest by all three permit holders was 181 fish at 300 pounds with an average price of \$.82 per pound for a total value of \$224.80. Both the Norton Sound and Port Clarence whitefish were marketed in Nome primarily as crab bait.

Subsistence Fishery

Whitefish have been taken mainly by beach seine or set gillnets. Catches are usually dried and used for human consumption or dog food. In some areas fish are "gutted" and dried early in the summer, while later in the summer the fish are filleted and dried with the eggs and viscera intact.

Subsistence catch enumeration is difficult since fishermen do not count fish individually, but by "tubs", "bags", "strings" or any other estimators of gross abundance. Additionally, many fish have been dried and consumed or stored in caches prior to the survey period. Reported subsistence harvests are the result of a limited and sporadic survey effort and should be regarded as minimum figures and not comparable from year to year. Recent and historical subsistence harvest figures for the Kotzebue District are presented in Appendix Table F7 by year.

Escapement

Whitefish escapements have not been monitored in the past, but there have been no indications from limited Department observations or fishermen interviews of declining populations.

Appendix Table .F7. Subsistence whitefish catch and effort in the Kotzebue District, 1970–1995. ^a

Year	Number of Fishermen Interviewed	Number of Whitefish Harvested
1970		58,165
1971		36,012
1977		30,810
1978		77,474
1979	123	43,653
1980	67	49,106
1981	71	37,746
1982	^b	^b
1983	47	16,389
1984	79	28,614
1985 ^c	46	5,229
1986 ^d	72	11,854
1987 ^d	46	20,020
1988 ^e	38	14,000
1989	^b	^b
1990	^b	^b
1991 ^d	63	16,015
1992 ^d	66	17,485
1993 ^d	70	19,060
1994	—	—
1995	—	—

^a Whitefish harvest information was collected during chum salmon subsistence surveys and is to be considered a small fraction of the annual catch.

^b Data unavailable.

^c Subsistence harvest information from Kiana and Shungnak villages only.

^d Subsistence interviews from Noatak, Noorvik and Shungnak villages only.

^e Subsistence harvest information from Noorvik and Shungnak villages only.

^f No surveys were conducted.

SAFFRON COD

Saffron cod, or tomcod as they are called locally, are extensively utilized as a subsistence resource in the Norton Sound, Port Clarence and Kotzebue Districts. Tomcod are taken through the ice by jigging as well as with gillnets in open water.

There has never been an extensive commercial fishery on tomcod in the Norton Sound, Port Clarence or Kotzebue areas. During 1980, one fisherman caught and sold 89 pounds (98 tomcod) in the Nome Subdistrict. There were no commercial landings during 1982. In 1983, one Nome area fisherman caught and sold 2,548 pounds (4,348 tomcod) and in 1989 one fisherman sold 1,800 pounds locally. These fish were used for dog food, crab bait and human consumption. No commercial deliveries were reported in during 1984-1988.

In 1994, Norton Sound Economic Development Corporation (N.S.E.D.C.) had provided a market for several fish species that had not been commercially utilized in the past. The need for crab bait was the primary factor in initiating the fishery at Unalakleet, where 1402 pounds were sold in seven deliveries in January and February of 1994. In 1995, the NSEDC market was not present which was likely a factor in the reduced harvest. The 1995 harvest totaled 52 pounds which sold for \$.50 per pound with a total value of \$26.00.

MISCELLANEOUS FINFISH SPECIES

Other finfish species taken for subsistence in the Norton Sound-Port Clarence-Kotzebue area include: rainbow smelt (boreal smelt), capelin, northern pike, starry flounders, yellow fin sole, arctic flounder, Alaska plaice, grayling, burbot, Pacific herring in the Fall time, and halibut (Appendix G1).

Subsistence utilization of these species has been documented although effort and catch vary widely in scale and importance with locality. Some of these species are important to the subsistence community in certain localities during specific seasons of the year.

Rainbow smelt, like saffron cod, had a limited commercial harvest at Unalakleet. During the January, February and March of 1994, 631 pounds of rainbow smelt were reported sold in nine deliveries for bait. The smelt and cod harvests from Unalakleet both occur in estuarine areas. The Smelt were reported to be higher in the water column than the cod. Either species could often be harvested from the same jigging site.

Burbot, or freshwater cod, have been sold intermittently in the past in the Kotzebue, Port Clarence and Norton Sound Districts. During 1995, a single delivery of 7 pounds from Unalakleet in the Norton Sound District sold for \$0.70 per pound.

Appendix G1. List of common and scientific names of finfish species of the Norton Sound, Port Clarence, and Kotzebue Districts.

Arctic lamprey	Lampetra japonica
Arctic char	Salvelinus alpinus
Arctic cod	Boreogadus saida
Arctic flounder	Liopsetta glacialis
Arctic grayling	Thymallus arcticus
Alaska plaice	Pleuronectes quadrituberculatus
Burbot	Lota lota leptura
Bering cisco	Coregonus laurettae
Bering poacher	Ocella dodecaedria
Bering wolffish	Anarhicas orientalis
Blackfish	Dallia pectoralis
Boreal smelt (rainbow-toothed)	Osmerus epselanus
Broad whitefish	Coregonus nasus
Capelin	Mallotus villosus
Dolly Varden	Salvelinus malma
Pond smelt	Hypomesus olidus
Humpback whitefish	Coregonus pidschian
Inconnu (sheefish)	Stenodus leucichthys
Lake trout	Salvelinus namaycush
Least cisco	Coregonus sardinella
Longhead dab	Liranda proboscidea
Ringtail snailfish	Liparis rutteri
Northern pike	Esox lucius
Longnose sucker	Catostomus
Pricklebacks	Stichaeidae
Pacific herring	Clupea harengus pallasi
Rock flounder	Lepidosetta bilineata
Rock greenling (terpug)	Hexagrammus lagocephalus
Round whitefish	Prosopium cylindraceum
Sculpins	Cottidae
Pink salmon	Oncorhynchus gorbuscha
Chum salmon	Oncorhynchus keta
Coho salmon	Oncorhynchus kisutch
Sockeye salmon	Oncorhynchus nerka
Chinook salmon	Oncorhynchus tshawytscha
Saffron cod	Eleginus gracilis
Stary flounder	Platichthys stellatus
Sandlance	Amrodites hexapterus
Sturgeon poacher	Agonus acipenserinus
Threespine stickleback	Gasterosteus aculeatus
Ninespine stickleback	Pungitius
Tubenose poacher	Pallasina barbata aix
Whitespotted greenling	Hexagrammus stelleri
Yellowfin sole	Limanda aspera

Appendix G2. Studies conducted within the Norton Sound, Port Clarence, and Kotzebue Districts, 1995.

Unalakleet Salmon Escapement Studies

a) Location: Unalakleet River

b) Objective: To maintain an index of salmon migration up the Unalakleet River using test gill nets.

c) Results: 1) The mean day of catch for chinook, chum, pink, and coho salmon was 6/22, 7/7, 7/14, and 8/20, respectively. The peak daily catch of chinook, chum, pink, and coho salmon occurred on 6/18, 7/4, 7/22, and 8/14 respectively.

2) The predominant age class in the test fish catch by the European aging method, by species was: chinook salmon 1.2 (age 4), chum salmon 0.4 (age 5) and coho salmon 2.1 (age 4).

3) The predominant age class in the commercial catch by the European aging method, by species was: chinook salmon 1.4 (age 6), chum salmon 0.4 (age 5) and coho salmon 2.1 (age 4).

Kwiniuk River Salmon Counting Tower

a) Location: About five miles upstream from the mouth of the Kwiniuk River in Norton Sound.

b) Objectives: Determine daily and seasonal timing and magnitude of chum and pink salmon runs. Determine age, sex and size of chinook and chum salmon of the commercial harvest in Moses Point Subdistrict and in the Kwiniuk River escapement.

c) Results: The 199 total expanded tower count: 485 chinook, 17,509 pink, 42,703 chum and 114 coho.

Niukluk River Salmon Counting Tower

a) Location: About five miles upstream from the mouth of the Kwiniuk River in Norton Sound.

b) Objectives: Determine daily and seasonal timing and magnitude of chum and pink salmon runs. Determine age, sex and size of chinook and chum salmon of the commercial harvest in Moses Point Subdistrict and in the Kwiniuk River escapement.

c) Results: The 199 total expanded tower count: 485 chinook, 17,509 pink, 42,703 chum and 114 coho.

Nome River Salmon Counting Tower

- a) Location: Nome River, Approximately 4 miles east of Nome.
- b) Objectives: 1) To determine daily and seasonal timing and magnitude of the spawning salmon runs.
2) Compare aerial survey totals with tower counts in order to improve survey accuracy.
3) A secondary objective as time and personnel allows would be to collect age and sex data through escapement sampling of subsistence catches, beach seining or possibly carcass sampling.
- c) Results: The 1994 total expanded tower count: 41 chinook, 2,969 chum, 142,604 pink, 1,283 coho, and 170 Dolly Varden.

Northwest Salmon Biological / Rehabilitation Projects

1. Hobson Creek Instream Incubation Project

- a) Location: A spring fed tributary to the Nome River
- b) Objective: Experimental instream incubator boxes for supplemental chum salmon production.
- c) Results: - 100,000 chum salmon eggs planted in 1 incubator box in 1994.
- 50,000 chum salmon fry emerged and released in 1995.
- 100,000 chum salmon eggs planted in 1 incubator box in 1995.

2. Boulder Creek Instream Incubation Project

- a) Location: A spring fed tributary to the Snake River
- b) Objective: Experimental instream incubator boxes for supplemental chum salmon production.
- c) Results: - 100,000 chum salmon eggs planted in 1 incubator box in 1994.
- 70,000 chum salmon fry emerged and released in 1995.
- 100,000 chum salmon eggs planted in 1 incubator box in 1995.

3. Shovel Creek Instream Incubation Project

- a) Location: A spring fed tributary to the Solomon River
- b) Objective: Experimental instream incubator boxes for supplemental chum salmon production.
- c) Results: - 10,000 pink salmon eggs planted in 1 incubator box in 1994.
- 6,000 pink salmon fry emerged and released in 1995.
- 50,000 pink salmon eggs planted in 1 incubator box in 1995.

4. Salmon Lake Limnology Project

- a) Location: A 1,851 acre lake at the headwaters of the Pilgrim River which drains into Port Clarence.
- b) Objective: To obtain limnological and biological data to evaluate the potential to restore the sockeye population to historic levels.
- c) Results: Two year study.

5. Glacial Lake Limnology Project

- a) Location: A 986 Acre lake at the headwaters of the Sinuk River. Drains into the Bering Sea.
- b) Objective: To obtain limnological and biological data to evaluate the potential to restore the sockeye population to historic levels.
- c) Results: Two year study.

6. Windfall Pond Coho Salmon Rehabilitation Project

- a) Location: Approximately 3 miles west of Nome.
- b) Objective: To develop over winter juvenile coho habitat.
- c) Results: Habitat development still in progress.

Kobuk River Test Fish Project

- a) Location: Lower Kobuk River
- b) Objectives: 1) To continue to evaluate the feasibility of indexing chum salmon abundance in the Kobuk River using systematic drift gill net catches.
2) Describe the migratory timing of chum salmon in the lower Kobuk River.
3) Sample for age, sex, and size data.
- c) Results: 1) Fishing began on July 12 and continued through August 16.
2) A total of 1,139 chum salmon were caught in a total of 202 drift time periods.
3) There were 1,025 ageable chum salmon scales collected from test net samples and the age composition was 2.2% Age 0.2, 61.5% Age 0.3, 34.0% Age 0.4, 2.2% Age 0.5.

Noatak River Test Fish Project

- a) Location: Lower Noatak River
- b) Objectives: 1) To evaluate the feasibility of indexing chum salmon abundance in the Noatak River using systematic drift gill net catches.

- 2) Describe the migratory timing for chum salmon in the lower Noatak River.
 - 3) Sample for age, sex, and size composition.
 - 4) To continue the collection of species apportionment information for the historical data base.
- c) Results:
- 1) Drift test fishing was conducted from July 19 through August 29, 1995.
 - 2) There was a total of 1,501 chum salmon caught in all gill nets combined. One thousand eighty two were from 6 inch mesh gill nets. A total of 140 drifts (70 drift time periods) with 6 inch mesh were conducted.
 - 3) Of the 1,302 ageable scales, the age composition was 1.9% Age 0.2, 56.1% Age 0.3, 39.9% Age 0.4, 1.8% Age 0.5, and 0.2% Age 0.6.

Subsistence Fishing Surveys

- a) Location: Norton Sound, Port Clarence, and Kotzebue Districts.
- b) Objectives: Determine subsistence utilization of salmon for formulating management procedures and goals. House-to-house surveys were conducted in the Norton Sound, Port Clarence, and Kotzebue District surrounding villages by the State of Alaska Division of Subsistence. Subsistence salmon permits were issued in the Nome Subdistrict.
- c) Results:
- 1) A total of 582 households were surveyed in the Kotzebue District villages and the total reported salmon harvest was estimated to be 228 chinook, 102,880 chum, 2,059 pink, 935 sockeye, and 2,560 coho salmon.
 - 2) A total of 122 households were surveyed in the Port Clarence District villages and the total reported salmon harvest was 76 chinook, 6,011 chum, 3,293 pink, 4,481 sockeye, and 1,739 coho salmon.
 - 3) A total of 720 households were surveyed in the Norton Sound District villages including Nome. The total reported salmon harvest was 7,766 chinook, 43,014 chum, 38,594 pink, 1,222 sockeye, and 23,3015 coho salmon.
 - 4) A total of 106 permits were issued for the Nome Subdistrict of Norton Sound in 1995 and 129 permits were returned. Their estimated total catches were 36 chinook, 211 sockeye, 486 pink, 5,344 chum, and 1,897 coho salmon.

Commercial Catch Sampling

- a) Locations: Norton Sound, Port Clarence and Kotzebue Sound.
- b) Objective: Obtain age, sex, and size information for commercially caught herring, salmon and king crab.
- c) Results: Approximately 2,942 herring, 5,621 salmon, and 1,050 king crab were sampled in 1995. These data are being analyzed and will be presented in separate reports.

Herring Test Fishing

- a) Location: Norton Sound ocean waters; camps located at Cape Denbigh and Klikitarik; a third test fish crew operated out of Unalakleet.
- b) Objectives: To determine age class composition of the Norton Sound herring return through test fishing with variable mesh gill nets.
- c) Results: Gill nets were operated from May 13 through June 15. Scale analysis of test fish catches has been completed; results are listed in Figure 13.

Nearshore Winter King Crab Study

- a) Location: Ocean waters of Norton Sound 1 to 2.5 miles south of Nome.
- b) Objective: To observe the abundance and distribution of red king crab in nearshore Nome waters. Also to evaluate the effectiveness of the "15 mile summer commercial crab closure" in protecting inshore crab; to obtain basic life history data using hog ring tags and testing Floy tags.
- c) Results:
 - 1) A total of 858 male and 10 female red king crab were collected and sampled from 12 sites between March 3 and April 7, 1995.
 - 2) A total of 514 male crab were tagged and released (374 legal size and 140 sublegals).

Preseason King Crab Pot Survey

- a) Location: Coastal waters near Nome between Solomon River mouth and Sledge Island within 15 miles of the beach.
- b) Objective: To survey the abundance of legal and sublegal as an index of stock health and determine the placement of the closed waters boundary line.

- c) Results: A total of 1,185 legal male, 722 sublegal male, and 24 female red king crab were caught and sampled. A distribution map was created that illustrated crab density specific to age group.

King Island King Crab Pot Survey

- a) Location: Coastal waters within 10 miles surrounding King Island in the Northern District of the Bering Sea.

- b) Objective: To investigate the abundance and distribution of blue king crab near King Island.

- c) Results: On June 22, 1995, 43 pots were deployed and 481 blue king crab were captured (14% legal males, 50% sublegal males, and 36% females), no red king crab were captured.

A. (G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-1-95	June 12, 1995 6:00 p.m. ADT	This emergency order opens the Norton Bay, Shaktoolik, and Unalakleet Subdistricts to commercial king salmon fishing for a standard 24 hour period at 6:00 p.m. Monday, June 12. The fishing period will run from 6:00 p.m. Monday until 6:00 p.m. Tuesday. Only nets with a mesh size of seven and one-half inches or larger will be allowed.	Subsistence catch data and the Unalakleet test fishing data both indicate the king salmon migration is now moving into the rivers. King salmon have been present in nearshore waters for at least ten days. King salmon were caught in the Unalakleet test net on its first day of operation, June 5. This would appear to be earliest king migration in the history of the project. Chum salmon catches in the Unalakleet test net are also early, 1995 is the second earliest migration in the history of the project. This indicates a good start on both chum and king escapement. Pink salmon have not yet been observed in subsistence nets or the test nets. Odd year returns of pink salmon are generally weaker than even year returns and are not expected to be present in significant numbers for at least two weeks. Pink salmon directed openings are anticipated after July 1. This opening is intended to test the king salmon run strength. If the harvest rates in the three subdistricts appear to be of normal strength, a regular schedule of openings will be announced. If the harvest rates are judged to be low, the regular schedule will be delayed until the following Monday. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-2-95	June 16, 1995 6:00 p.m. ADT	This emergency order closes the Nome Subdistrict to subsistence salmon fishing in the Sinuk, Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza, and Solomon Rivers. In addition, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, as well as ocean waters from the Cape Nome jetty west to the Sinuk River mouth are closed to salmon fishing from 6:00 p.m. June 16 through July 30.	During the four year period, 1987 to 1990 salmon escapements in the immediate Nome area were well below historic levels and the levels the department staff believes are needed to maintain the salmon runs. This is particularly true of the chum salmon stocks. During the past four years, the trend of declining chum salmon escapements was broken. Many streams in the Nome area were judged to have adequate chum escapement levels. A similar management technique to what was used in 1993 is planned for the 1995 season. Subsistence fishing will reopen as pink salmon become abundant and as chum escapement goals are met. Various locations and streams will be judged individually and opened on the basis of their individual chum salmon escapement and pink salmon abundance. The staff will be flying frequent surveys and boating some of the rivers to track the salmon migration's strength and progress. The counting towers on the Nome, Snake, and Eldorado rivers will also be used to track the various salmon migrations. If a stream appears to have adequate escapement, restrictions will be lifted in that area; otherwise, the restrictions will remain in place until they no longer benefit the species of concern. Ocean subsistence fishers of the Nome Subdistrict are reminded of the regulatory change that occurred over the last winter. That change is that a maximum of 50 fathoms of net may be used in saltwater and that only 50 feet of net may be used in freshwater. The fishing period in saltwater has been extended, now beginning at 6:00 p.m. Monday; closing 6:00 p.m. Saturday. Freshwater openings will continue to be the two 48 hour openings beginning at 6:00 p.m. Mondays and Thursdays.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-3-95	June 15, 1995 6:00 p.m. ADT	This emergency order opens the Norton Bay, Shaktoolik, and Unalakleet Subdistricts to commercial king salmon fishing for a weekly schedule of two standard 24 hour periods each week. The fishing periods will run from 6:00 p.m. Thursday until 6:00 p.m. Friday and from 6:00 p.m. Monday until 6:00 p.m. Tuesday. Only nets with a mesh size of seven and one-half inches or larger will be allowed.	The first king salmon opening at Unalakleet indicates a somewhat above average run. There was very little fishing effort at Shaktoolik due to the lack of a tender, which may have affected the success of the Unalakleet Subdistrict fishery. Shaktoolik fishermen had to transport their catch to Unalakleet for sale. The Unalakleet test net indicates an average or slightly above average escapement. Subsistence catches indicate at least average run strength as well. On the basis of these early season indices a standard fishing schedule of two 24 hour periods per week is established. Fishing periods will continue to be monitored to better evaluate the strength of the king salmon return. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-4-95	June 20, 1995 6:00 a.m. ADT	This emergency order places the Norton Bay, Shaktoolik, and Unalakleet Subdistricts on a standard weekly commercial king salmon fishing schedule of two 48 hour periods each week. The fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Wednesday and from 6:00 p.m. Thursday until 6:00 p.m. Saturday. Only nets with a mesh size of seven and one-half inches or larger will be allowed.	King salmon escapements in the Unalakleet River are strong for the mid-point of the migration into freshwater. The current king salmon opening at Unalakleet indicates a continued strong return. Fishing effort at Shaktoolik has been low due to the lack of a tender, which would help to ensure a strong escapement there as well. Subsistence catches indicate at least average run strength. On the basis of these season indices, a standard fishing schedule of two 48 hour periods per week is established. Fishing periods will continue to be monitored to better evaluate the strength of the king salmon return. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-5-95	June 20, 1995 6:00 p.m. ADT	This emergency order places the Norton Bay, Shaktoolik, and Unalakleet Subdistricts on a standard weekly commercial king salmon fishing schedule of two 48 hour periods each week. The fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Wednesday and from 6:00 p.m. Thursday until 6:00 p.m. Saturday. Only nets with a mesh size of seven and one-half inches or larger will be allowed.	King salmon escapements in the Unalakleet River are strong for the mid-point of the migration into freshwater. The current king salmon opening at Unalakleet indicates a continued strong return. Fishing effort at Shaktoolik has been low due to the lack of a tender, which would help to ensure a strong escapement there as well. Subsistence catches indicate at least average run strength. On the basis of these season indices, a standard fishing schedule of two 48 hour periods per week is established. Fishing periods will continue to be monitored to better evaluate the strength of the king salmon return. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-6-95	June 29, 1995 6:00 p.m.ADT	This emergency order opens Subdistricts 5 and 6 to commercial pink salmon fishing on a schedule of three periods each week. The periods will run from noon Monday until noon Tuesday and from noon Wednesday until noon Thursday and from noon Friday until midnight Saturday. Gillnet mesh size will be limited to four inches to four and one-half inches. Drifting of gillnets will be allowed during this pink salmon opening	A fish processor has expressed an interest in buying Norton Sound pink salmon. This developing fishery does not have the benefit of multiyear data bases with which to index run strength, escapement or potential harvest. Pink salmon in this district have rarely been exploited near their carrying capacity. The odd year returns have been relatively weak since 1983. A low to moderate level of harvest is thought to be possible without adversely affecting escapements needed to generate a sustainable return or significantly decreasing subsistence harvests. The odd year pink migration into fresh water have peaked on the average date of July 15 over the past six generations at the Unalakleet River. This is nine days later than the even year cycles. This fishing schedule will allow the department and processor to evaluate the feasibility of an odd year pink fishery and its effect on escapement. Should the impact of the fishery be judged to be detrimental to either the escapement or the subsistence fishery, the commercial pink salmon fishery will be closed and possibly redirected to other subdistricts further north. The management plan distributed prior to the season stated the department's intent to distribute the pink salmon fishery over Subdistricts 2, 3, 4, 5, and 6. This will be done in an effort to avoid overharvest in any one particular watershed. Fishermen should be prepared for a short pink salmon fishing season at any one location. The processor has requested several short openings each week. The king and chum salmon escapements are both doing well in the Unalakleet and Shaktoolik Subdistricts. Pink salmon are present in nearshore waters and just beginning their upstream migration. Generally speaking, pink salmon move into freshwater a few days earlier in eastern Norton Sound than in the northern subdistricts. The buyer has positioned their processor near Unalakleet. Each of these factors, influenced the decision to allow a limited pink salmon commercial fishery in the Unalakleet and Shaktoolik Subdistricts.
3-Z-S-7-95	July 13, 1995 6:00 p.m.ADT	This emergency order opens the Flambeau, Eldorado, and Bonanza Rivers to a standard subsistence fishing schedule of two 48 hour periods each week beginning at 6:00 p.m. Mondays and Thursdays. In addition, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge will be open on that same schedule. The Sinuk, Cripple, Penny, Snake, Nome, and Solomon Rivers, as well as ocean waters from the Cape Nome jetty west to the Sinuk River mouth are closed to subsistence salmon fishing.	Aerial surveys of the Nome Subdistrict streams and salmon counts from the Eldorado Salmon Counting Tower indicate the escapement goals for chum salmon have been met in the Flambeau, Eldorado and Bonanza Rivers. Unfortunately, the pink salmon return this season has been disappointing. Those rivers that are primarily pink salmon producers will remain closed until that situation turns around. The cool weather seems to have delayed the chum returns in western Norton Sound. This may explain the weak showing of chums west of Cape Nome. The staff will continue flying frequent surveys, tracking the counting tower data, and boating some of the rivers to track the salmon migrations' strength and progress. If a stream appears to have adequate escapement, restrictions will be lifted in that area; otherwise, the restrictions will remain in place until they no longer benefit the species of concern. Ocean subsistence fishers of the Nome Subdistrict are reminded of the regulatory change that occurred over the last winter. That change is that a maximum of 50 fathoms of net may be used in saltwater and that only 50 feet of net may be used in freshwater. The fishing period in saltwater has been extended, the periods now begin 6:00 p.m. Monday and close 6:00 p.m. Saturday. Freshwater openings will continue to be the two 48 hour openings beginning at 6:00 p.m. on Mondays and Thursdays.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-8-95	July 17, 1995 12:00 noon ADT	This emergency order closes the Unalakleet and Shaktoolik Subdistrict until further notice. The emergency order also opens Subdistricts 2 and 3 to commercial pink salmon fishing on a schedule of three periods each week. The periods will run from 6:00 p.m. Monday until 6:00 p.m. Tuesday and from 6:00 p.m. Wednesday until 6:00 p.m. Thursday and from 6:00 p.m. Friday until 6:00 p.m. Saturday. Gillnet mesh size will be limited to four inches to four and one-half inches. The boundaries of the subdistricts will be modified. Subdistrict 2 will be restricted to Golovin Bay from a line drawn between the southernmost points of Cape Darby and Rocky Point to a line across the narrows at the Golovin Spit and South Spit on the opposite side of the bay. Subdistrict 3 will be modified to the waters from Iron Creek mouth to Canyon Creek mouth at Portage Roadhouse.	The pink salmon return at Unalakleet and Shaktoolik is still building, but escapements have been minimal. By closing the commercial fishery at this time the peak of the pink salmon return should be able to enter the river to provide an adequate subsistence harvest and escapement. A fish processor has expressed an interest in buying Norton Sound pink salmon. There has been some concern expressed regarding the availability of pink salmon for escapement and subsistence harvests. The modifications of the subdistrict boundaries are intended to direct the commercial harvest to brighter fish which are less preferred by subsistence users. That restriction will have the affect of limiting the harvest to some extent as well. Pink salmon in this district have rarely been exploited near their carrying capacity. The odd year returns have been relatively weak since 1983. A low to moderate level of harvest is thought to be possible without adversely affecting escapements needed to generate a sustainable return or significantly decreasing subsistence harvests. The odd year pink migration into fresh water has peaked on the average date of July 19 over the past six generations at the Kwiniuk River. This is eight days later than the even year cycles. This fishing schedule will allow the department and processor to evaluate the feasibility of an odd year pink fishery and its effect on escapement. Should the impact of the fishery be judged to be detrimental to either the escapement or the subsistence fishery, the commercial pink salmon fishery will be closed. The management plan distributed prior to the season stated the department's intent to distribute the pink salmon fishery over Subdistricts 2, 3, 4, 5, and 6. This will be done in an effort to avoid overharvest in any one particular watershed. Fishermen should be prepared for a short pink salmon fishing season at any one location.
3-Z-S-9-95	July 17, 1995 6:00 p.m ADT	This emergency order allows the use of beach seines as a legal subsistence gear type in the Nome Subdistrict for salmon other than pink salmon during the regular scheduled open subsistence fishing periods through July 31. Any pink salmon caught in a beach seine must be immediately returned to the water.	The Alaska Board of Fisheries created this regulation designed to allow the customary use of beach seines, which can be very efficient, while protecting a weak salmon species in a mixed stock fishery. Currently, there are several streams open to subsistence fishing because chum salmon returns in those areas have exceeded their respective escapement goals. However, pink salmon returns appear very weak in those same rivers. By allowing the use of beach seines with the requirement that no pink salmon may be retained, the intent of the Board of Fish can be satisfied while protecting the weak pink salmon returns. This Emergency Order only allows the use of beach seines as an alternate gear type in fishing areas of Subdistrict 1 opened by separate Emergency Orders and is only effective from July 17 through July 31. The Department will continue to monitor the salmon returns to the area by aerial survey, the Nome River counting tower, boat surveys, and cooperative projects on the Snake and Eldorado Rivers with Kawerak and Sitnasuak Corporations. Fishing areas and methods may change as the salmon returns develop.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-10-95	July 24, 1995 6:00 p.m. ADT	This emergency order closes the Golovin and Elim Subdistricts until further notice. The emergency order also opens the Unalakleet and Shaktoolik Subdistricts to commercial chum and silver salmon fishing for a single 48 hour opening beginning Monday July 24 at 6:00 p.m. Gillnet mesh size will be limited to a maximum of six inches.	The pink salmon return throughout Norton Sound has been disappointing. Although the pink salmon return is still in progress, the escapements are all projected to be well below average compared to recent odd years. For that reason, there are no further commercial pink salmon directed openings planned for 1995. A salmon buyer has expressed an interest in purchasing chum and silver salmon in the Shaktoolik and Unalakleet Subdistricts for a single 48 hour period beginning Monday. The chum escapement in those subdistricts is judged to be strong and the early indications on the silver salmon migration are good as well. This commercial period will provide an early assessment of the building silver salmon migration.
3-Z-S-11-95	July 24, 1995 6:00 p.m. ADT	This emergency order opens the ocean waters from Cape Nome to the Sinuk River mouth, to a standard subsistence fishing schedule of a five day period each week beginning at 6:00 p.m. Monday. This emergency order opens all the marine waters of the Nome Subdistrict to subsistence fishing. In addition, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, as well as the Flambeau, Eldorado, and Bonanza Rivers are open on their standard schedules. The Sinuk, Cripple, Penny, Snake, Nome, and Solomon Rivers will remain closed to subsistence salmon fishing.	Aerial surveys of the Nome Subdistrict streams flown July 24 indicate the chum salmon escapements west of Cape Nome are still below the goals set for those rivers. The Nome and Snake rivers are thought to be 95% of their goals and the Sinuk is at 75% of its goal. Pink salmon returns in those rivers are small and would not support much harvest. Silver salmon are now in nearshore waters but very few have entered fresh water. By opening saltwater in the western half of the subdistrict, the pink and chum salmon escapements should be affected very little. Subsistence fishers will be given an opportunity to harvest the coho salmon and a few late arriving chum salmon. Rivers will be opened for subsistence purposes once the silver salmon migration enters the local streams and the spawning cycle of the chum and pink salmon is nearer completion. Ocean subsistence fishers of the Nome Subdistrict are reminded of the regulatory change that occurred over the last winter. That change is that a maximum of 50 fathoms of net may be used in saltwater and that only 50 feet of net may be used in freshwater. The fishing period in saltwater has been extended, the periods now begin 6:00 p.m. Monday and close 6:00 p.m. Saturday. Freshwater openings will continue to be the two 48 hour openings beginning at 6:00 p.m. on Mondays and Thursdays.
3-Z-S-12-95	July 31, 1994 12:00 noon ADT	This emergency order opens the commercial silver salmon fisheries at Golovin, Elim, Shaktoolik, and Unalakleet Subdistricts for the remainder of the season. The commercial fishing periods at Golovin will consist of three 24 hour periods each week beginning at noon each Monday, Wednesday and Friday. In Elim Subdistrict, the periods will also run 24 hours from 3:00 p.m. to 3:00 p.m. beginning on Monday and Wednesday each week. In the Unalakleet and Shaktoolik Subdistricts, commercial fishing will be allowed from 6:00 p.m. Monday until 6:00 p.m. Wednesday and from 6:00 p.m. Thursday until 6:00 p.m. Saturday.	A salmon buyer has expressed an interest in purchasing silver salmon in the Golovin Bay, Elim, Shaktoolik and Unalakleet Subdistricts beginning Monday. The chum escapement in those subdistricts is judged to be strong and the early indications on the silver salmon migration are good as well. This commercial fishing schedule provides a standard amount of fishing time in as many subdistricts as the buyer can cover. The level of fishing effort and success of each subdistrict's fishery will be monitored. Changes to these schedules may be made if market or run strength indicate a need for change.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-13-95	August 1, 1995 6:00 p.m.ADT	This emergency order opens the Nome Subdistrict to the normal subsistence gillnet fishing schedule effective August 1. Beach seining is closed in the Nome Subdistrict until further notice. Subsistence fishing is prohibited in the Nome River within 200 yards of the mouth and upstream of Osborne, and in the Sinuk and Solomon Rivers upstream of the markers.	Chum salmon escapements in most streams in the Nome Subdistrict are thought to be adequate. The chum salmon returning during August to this subdistrict have been few in past years. Pink salmon have been late this season and are still continuing their migration. The pink escapement is expected to be roughly half the recent average odd year escapement. Silver salmon are apparently on track for an average return in both timing and magnitude. This schedule of set net openings will allow subsistence fishers to harvest the fresh silver salmon and make limited use of both the pink and chum salmon as those runs wind down. The department staff has concern for the weak pink salmon returns and the early portion of the silver salmon return. Should the silver salmon escapement be judged adequate beach seining will be allowed. Ocean subsistence fishers of the Nome Subdistrict are reminded of the regulatory change that occurred over the last winter. That change is that a maximum of 50 fathoms of net may be used in saltwater and that only 50 feet of net may be used in freshwater. The fishing period in saltwater has been extended, the periods now begin 6:00 p.m. Monday and close 6:00 p.m. Saturday through August 15. Marine waters will be open seven days per week after August 15. Freshwater openings will continue to be the two 48 hour openings beginning at 6:00 p.m. on Mondays and Thursdays through August.
3-Z-S-14-95	August 3, 1995 6:00 p.m.ADT	This emergency order opens the Nome Subdistrict to a standard salmon fishing schedule of two 24 hour periods each week beginning at 6:00 p.m. Monday and closing at 6:00 p.m. Tuesday and opening at 6:00 p.m. Thursday and closing at 6:00 p.m. Friday. This emergency order is in effect beginning Thursday August 3 until further notice.	Two commercial fishermen have requested they be allowed to commercially harvest silver salmon in the Nome Subdistrict. The silver salmon return is expected to be at least average during 1995. The Nome, Snake, and Eldorado River towers indicate that the silver salmon migration is now beginning. The chum salmon return is continuing and escapement goals for chum salmon now appear to be met throughout the subdistrict. Although these stocks must support a subsistence and sport harvest, it is thought that the limited commercial harvest can be allowed as it has been in recent years. Should either the escapement or subsistence harvests be judged to be inadequate, this commercial season will be closed.
3-Z-S-15-95	August 2, 1995 6:00 p.m. ADT	This emergency order opens a Norton Sound herring gillnet commercial fishing period in Subdistrict 5 beginning at 10:30 a.m. until 3:00 p.m. Monday, May 31. Each boat will be limited to not more than 100 fathoms of gillnet.	Recent department and industry aerial surveys have documented a harvestable biomass of herring remaining in Subdistrict 5. Currently there are still about 1,400 tons remaining as an allowable harvest for the gillnet fishery in Norton Sound. The majority of buyers are still interested in purchasing quality sac roe herring. With the concern of the biomass being recruit herring, the department's crew was sent to the vicinity of Elim to test fish. The majority of the fish were larger, older fish. Industry testing found a range of quality with a mix of spent and ripe females. Samples improved as the tide began rising but quality remained just above 9%. The majority of the buyers were satisfied with the samples and requested an opening. The department warned buyers and fishermen that quality was marginal and to deliver frequently so that quality could be monitored. Buyers are to call the department one and one-half hours prior to the closure with preliminary results. This will allow managers to assess quality for a possible extension.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-16-95	August 7, 1995 8:00 p.m.ADT	This emergency order changes the commercial salmon fishing schedules in Subdistricts 2, 3, 5, and 6. The Golovin Bay fishing schedule will now run from 8:00 a.m. until 8:00 a.m. for three 24 hour fishing periods per week beginning Monday, Wednesday, and Friday. The Moses Point schedule is also composed of three 24 hour openings beginning at 4:00 p.m. Monday, Wednesday, and Friday. The Unalakleet and Shaktoolik Subdistricts Will have two 48 hour openings each week. The Shaktoolik fishing periods will continue to open at 6:00 p.m. Mondays and Thursdays, but Unalakleet will now open on Noon Mondays and Thursdays.	Participation in the commercial fisheries at Golovin and Moses point continues to be low. Harvests are small and are not thought to have much impact on escapement. Weather had an adverse impact at Shaktoolik during the last period, but harvests were strong at Unalakleet and coho salmon escapement began to rise as well. This fishing schedule does not change the period length, instead it adjusts fishing time to allow the buyer to maximize the use of the processing vessel and make the best use of transportation opportunities available to Unalakleet. This fishing schedule may have the effect of actually reducing participation due to conflicts the fishermen may encounter with their other activities.
3-Z-S-17-95	August 14, 1995 12:00 noon ADT	This emergency order changes the commercial salmon fishing schedules in Subdistricts 2, 3, and 6. The Golovin Bay and Moses Point Subdistrict fishing schedules will now consist of three 24 hour fishing periods per week. Periods will begin at 12:00 noon each Monday, Wednesday, and Friday. The Unalakleet Subdistrict period times will also change. Now both the Unalakleet and Shaktoolik Subdistricts will be fishing on the same schedule of two 48 hour openings per week beginning at 6:00 p.m. each Monday and Thursday.	The only major salmon buyer operating in Norton Sound has requested these schedule changes in order to operate more efficiently under the new market conditions. The buyer has also indicated they will likely discontinue operations before the end of the season. Coho salmon returns to the Golovin Bay and Moses Point Subdistricts continue to build while commercial fishing effort and harvest has been low. Commercial fishing is thought to have had minimal impact on escapement so far. The coho salmon return to the Unalakleet Subdistrict is slightly delayed compared to an average year, but is building at a normal rate and appears to be on track for an average size return. These fishing schedule changes are expected to maximize the efficiency of the salmon buyer's operations with minimal change to escapement rates since there is no net change in fishing time.
3-Z-S-18-95	August 14, 1995 12:00 noon ADT	This emergency order changes the commercial salmon fishing schedules in Subdistricts 2 and 3. The Golovin Bay and Moses Point Subdistrict fishing schedules will now consist of two 48 hour fishing periods per week. Periods will run from 12:00 noon Monday to 12:00 noon Wednesday and from 12:00 noon Thursday to 12:00 noon Saturday.	There has been a sudden drop in market value for Norton Sound coho salmon. During previous commercial periods, a more restrictive fishing schedule had been in effect at the request of the only major salmon buyer operating in Norton Sound. The buyer has since changed their operations and timing has become less critical. The buyer has also indicated they will likely discontinue operations before the end of the season. Coho salmon returns to the Golovin Bay and Moses Point Subdistricts continue to build while commercial fishing effort and harvest has been low. Commercial fishing is thought to have had minimal impact on escapement so far. The increase of fishing time by one additional day per week puts both subdistricts on a fishing schedule which is typical for an average coho return to those subdistricts. It is expected that declining salmon prices and the likelihood of a shortened season will have the effect of reducing fishing effort, thus compensating at least in part for the increased fishing period length. These fishing schedules are likely to change as the market develops and better information becomes available.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-19-95	August 24, 1995 6:00 p.m.ADT	This emergency order closes commercial salmon fishing in Subdistrict 1 effective Thursday August 24 and in the remainder of Norton Sound effective Saturday August 26 at the close of the fishing periods.	The silver salmon return has shown itself to be weak throughout Norton Sound. Commercial harvest rates range from normal to weak as one moves from eastern to northern Norton Sound. Escapement indices, the tower counts of Subdistricts 1 and 2 and the test net in Subdistrict 6, indicate below normal escapements. Fisher reports from the Nome Subdistrict streams indicate a serious shortage of silver salmon at the spawning sites. This late season closure is intended to allow additional escapement by allowing the remainder of the silver salmon migration to enter freshwater.
3-Z-S-20-95	August 24, 1995 6:00 p.m. ADT	This emergency order closes the Nome Subdistrict streams and the Pilgrim River to subsistence fishing effective noon Friday August 25 through September 15. The rivers closed to subsistence fishing include the Cripple, Penney, Snake, Nome, Flambeau, Eldorado, Bonanza, Solomon and Pilgrim Rivers, including the waters of Safety Sound and Bonanza Channel inside the Safety Bridge.	Silver salmon are experiencing a particularly weak return in the vicinity of Nome. In recent days, a number of callers have expressed their concern for the state of the silver salmon runs. The counting tower at the Nome River has documented the lowest silver escapement in the three years the project has operated. Department staff have waited as late in the season as they believe advisable for a surge in migration. The recent southerly winds and precipitation did trigger some increase in migration into freshwater, but escapements are far below normal. This recent series of closures affecting all fisheries is intended to allow additional escapement and to protect the spawning silver salmon that have begun spawning in the local rivers.
3-S-01-95	August 25, 1995 12:00 p.m. ADT	This emergency order closes all marine and freshwaters from the west bank of the Cripple River to the east bank of the Solomon River and the Pilgrim River to sport fishing for coho salmon. Effective 12:00 noon Friday, August 25, 1995 until September 30, 1995, all silver salmon caught on sport fishing tackle in the Cripple, Penny, Snake, Nome, Flamneau, Eldorado, Bonanza, Solomon and Pilgrim Rivers, and salt and brackish waters between the west bank of the Cripple River and the east bank of the Solomon River, including Safety Sound and Bonanza Channel, must be immediately released.	Although coho salmon runs in eastern Norton Sound have been slightly below average in strength, escapements into Nome subdistrict streams has been the lowest observed in the past three years. As of August 21, 1995, only about 900 coho salmon had passed the counting tower on the Nome River. During 1993, more than 3,800 coho salmon had passed the tower by this time. Other rivers in the Nome Subdistrict and the Pilgrim River are experiencing similarly low coho escapements. The Department considers it prudent to close waters in the Nome Subdistrict to sport fishing for coho salmon at this time to allow for additional escapement and to protect spawners already in Nome area streams. These restrictions will be lifted if the strength of the coho run increases such that it will allow adequate escapement and additional harvest.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-1-95	July 10, 1995 6:00 p.m. ADT	This emergency order places the Kotzebue District on the normal commercial salmon fishing schedule of two 24 hour periods per week beginning at 6:00 p.m. Monday, July 10 until further notice. The commercial fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Tuesday and from 6:00 p.m. Thursday until 6:00 p.m. Friday.	In keeping with the management plan published prior to the season, the commercial fishery will open the evening of July 10. The opening and closure time has been adjusted to meet airline schedules. This will allow a better product as all salmon sold are iced whole and flown out. The most reliable index of chum salmon run strength is the commercial catch rate. Comparisons of catch rate trends over not less than three periods to the recent 16 year average will be the basis of management decisions early in the season. The buyers have stressed that as the season progresses, they will not be able to handle long periods due to the current market condition. As periods are shortened, historical catch rates will no longer be comparable for management decisions. Age composition and test fisheries will be a factor in management decisions as periods are shortened.
3-X-S-2-95	July 19, 1995 8:00 p.m. ADT	This emergency order opens the Kotzebue District to 3 commercial fishing periods, 12 hours each, beginning at 8:00 p.m. Wednesday, July 19. The commercial fishing periods will be from 8:00 p.m. Wednesday until 8:00 a.m. Thursday, 8:00 p.m. Thursday until 8:00 a.m. Friday and from 8:00 p.m. Friday until 8:00 a.m. Saturday.	Commercial period catches for the first period was just below average and for the second period was well above the historical average even though the number of fishermen is one-third the average. Early reports from the third period indicate that catches could be 1-1/2 to 2 times the average with less than half the fishermen. Age composition so far has been near average. The test fish project on the Kobuk River just recently began and the Noatak River test fish crew is preparing to set up that project. Processors are now concerned with overharvesting their capacities and have requested shorter but more frequent openings. Shorter openings combined with the frequent period schedule should provide for a higher quality product while allowing for fishing opportunities.
3-X-S-3-95	July 21, 1995 6:00 p.m. ADT	This emergency order reduces the commercial Period 6 in the Kotzebue District from 12 hours to 4 hours. The period will now begin at 6:00 p.m. and end at 10:00 p.m. on Friday, July 21.	One of the two processors have notified the department that they are having logistical problems sending totes to and from Kotzebue during these shorter, more frequent openings. Because of this, one of the two buyers will not be buying fish during tonight's opening, Friday, July 21. The remaining buyer is concerned about going beyond his processing capacity and has stated that they would accept a commercial period 4 hours in length.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-4-95	July 24, 1995 6:00 p.m. ADT	This emergency order opens the Kotzebue District to a 4 hour opening. The period will begin at 6:00 p.m. and end at 10:00 p.m. on Monday, July 24.	The Kotzebue District commercial period harvest to date has been roughly one-third above the historical average. The age composition this year has nearly mirrored the average age composition. The Kobuk River test fish index has now surpassed the previous two years index when comparing the same dates. In the first of those two years, aerial survey escapements were achieved. For the second year, carcass collection for age composition in Kobuk River tributaries and main stem indicated that escapements were well above average. Because the Noatak River sonar is not operating this year, there is no passage estimate information for that river to evaluate the run. However, test fish catches seem strong, even though it is early in the run and the river is clear leaving test nets vulnerable to net avoidance. All indices indicate an average to above average salmon return to the Kotzebue District. Because of state wide salmon markets, processing capacities for Kotzebue salmon are limited. Processors are accepting only so many pounds from the district. The department is in contact daily with these processors, discussing fishing periods for the immediate future. With at least an average run and less than half the average fishermen participating in the fishery, there is little concern at this time for an adequate escapement. Therefore, the department is allowing the more frequent, daily fishing periods as requested by the processors. Opening and closure times are adjusted to fit airline schedules in order to maintain a better quality product.
3-X-S-5-95	6:00 p.m. ADT July 24, 1995	This emergency order opens the Kotzebue District to a 6 hour opening. The period will begin at 6:00 p.m. Tuesday, July 25 and end at 12:00 a.m. on Wednesday, July 26.	Because of state wide salmon markets, processing capacities for Kotzebue salmon are limited. Processors are accepting only so many pounds from the district for each opening. The department is in daily contact with these processors, discussing fishing periods for the immediate future. With at least an average run and less than half the average fishermen participating in the fishery, there is little concern at this time for an adequate escapement. Therefore, the department is allowing the shorter but more frequent, daily fishing periods as requested by the processors. Opening and closure times are adjusted to fit airline schedules in order to maintain a better quality product.
3-X-S-6-95	July 26, 1995 6:00 p.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 6:00 p.m. and end at 9:00 p.m. on Wednesday, July 26.	Same justification as 3-X-S-5-95.
3-X-S-7-95	July 28, 1995 5:00 p.m. ADT	This emergency order opens the Kotzebue District to a 4 hour opening. The period will begin at 5:00 p.m. and end at 9:00 p.m. on Friday, July 28.	Same justification as 3-X-S-5-95.
3-X-S-8-95	July 31, 1995 5:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 6:00 p.m. and end at 8:00 p.m. on Monday, July 31.	Same justification as 3-X-S-5-95.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-9-95	July 31, 1995 6:00 p.m. ADT	This emergency order extends Period 11 in the Kotzebue District from a 2 hour opening to a 3 hour opening. The period will begin at 6:00 p.m. and end at 9:00 p.m. on Monday, July 31.	The only buyer purchasing fish for Period 11 has received additional totes to transport salmon. That buyer has requested an extension of one hour as he can handle more salmon than he had originally anticipated.
3-X-S-10-95	August 1, 1995 5:00 p.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 5:00 p.m. and end at 8:00 p.m. on Tuesday, August 1.	Same justification as 3-X-S-9-95.
3-X-S-11-95	August 2, 1995 7:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 7:00 p.m. and end at 9:00 p.m. on Wednesday, August 2.	Same justification as 3-X-S-9-95.
3-X-S-12-95	August 3, 1995 6:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 6:00 p.m. and end at 8:00 p.m. on Thursday, August 3.	Same justification as 3-X-S-9-95.
3-X-S-13-95	August 18, 1995 6:00 p.m. AD	This emergency order cancels the 2 hour period scheduled for Thursday, 6:00 p.m. to 8:00 p.m. in the Kotzebue District.	One of the two original buyers notified the department that his processing plant in Anchorage has developed a problem and that he would not be able to purchase fish. The second processor could not handle an opening during the peak of the salmon run alone leaving no buyers for the commercial opening.
3-X-S-14-95	August 4, 1995 6:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 6:00 p.m. and end at 8:00 p.m. on Friday, August 4.	Same justification as 3-X-S-9-95.
3-X-S-15-95	August 7, 1995 5:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 5:00 p.m. and end at 7:00 p.m. on Monday, August 7.	Same justification as 3-X-S-9-95.
3-X-S-16-95	August 8, 1995 9:00 a.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 4:00 p.m. and end at 7:00 p.m. on Tuesday, August 8.	Same justification as 3-X-S-9-95.
3-X-S-17-95	August 9, 1995 4:00 a.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 4:00 p.m. and end at 7:00 p.m. on Wednesday, August 9.	Same justification as 3-X-S-9-95.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-18-95	August 10, 1995 4:00 p.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 4:00 p.m. and end at 7:00 p.m. on Thursday, August 10.	Same justification as 3-X-S-5-95.
3-X-S-19-95	August 11, 1995 4:00 p.m. ADT	This emergency order opens the Kotzebue District to a 3 hour opening. The period will begin at 4:00 p.m. and end at 7:00 p.m. on Friday, August 11.	Same justification as 3-X-S-5-95.
3-X-S-20-95	August 14, 1995 5:00 p.m. ADT	This emergency order opens the Kotzebue District to a 2 hour opening. The period will begin at 5:00 p.m. and end at 7:00 p.m. on Monday, August 14.	Same justification as 3-X-S-5-95.
3-X-S-21-95	August 15, 1995 2:00 p.m. ADT	This emergency order opens the Kotzebue District to a 4 hour opening. The period will begin at 2:00 p.m. and end at 6:00 p.m. on Tuesday, August 15.	Same justification as 3-X-S-5-95.
3-X-S-22-95	August 16, 1995 12:00 noon ADT	This emergency order opens the Kotzebue District to a 6 hour opening. The period will begin at 12:00 p.m. and end at 6:00 p.m. on Wednesday, August 16.	Same justification as 3-X-S-5-95.
3-X-S-23-95	August 17, 1995 10:00 a.m. ADT	This emergency order opens the Kotzebue District to an 8 hour opening. The period will begin at 10:00 a.m. and end at 6:00 p.m. on Thursday, August 17.	Same justification as 3-X-S-5-95.
3-X-S-24-95	August 18, 1995 2:00 p.m. ADT	This emergency order opens the Kotzebue District to a 4 hour opening. The period will begin at 2:00 p.m. and end at 6:00 p.m. on Friday, August 18.	Same justification as 3-X-S-5-95.
3-X-S-25-95	August 21, 1995 11:00 a.m. ADT	This emergency order opens the Kotzebue District to a 7 hour opening. The period will begin at 11:00 a.m. and end at 6:00 p.m. on Monday, August 21.	Same justification as 3-X-S-5-95.
3-X-S-26-95	August 22, 1995 6:00 a.m. ADT	This emergency order opens the Kotzebue District to a 12 hour opening. The period will begin at 6:00 a.m. and end at 6:00 p.m. on Tuesday, August 22.	Same justification as 3-X-S-5-95.
3-X-S-27-95	August 23, 1995 6:00 a.m. ADT	This emergency order opens the Kotzebue District to a 12 hour opening. The period will begin at 6:00 a.m. and end at 6:00 p.m. on Wednesday, August 23.	Same justification as 3-X-S-5-95.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-28-95	August 24, 1995 6:00 a.m. ADT	This emergency order opens the Kotzebue District to a 12 hour opening. The period will begin at 6:00 a.m. and end at 6:00 p.m. on Thursday, August 24.	Same justification as 3-X-S-5-95
3-X-S-29-95	August 25, 1995 6:00 a.m. ADT	This emergency order opens the Kotzebue District to a 12 hour opening. The period will begin at 6:00 a.m. and end at 6:00 p.m. on Friday, August 25.	Same justification as 3-X-S-5-95
3-X-S-30-95	August 28, 1995 6:00 a.m. ADT	This emergency order opens the Kotzebue District to a 12 hour opening. The period will begin at 6:00 a.m. and end at 6:00 p.m. on Monday, August 28.	Same justification as 3-X-S-5-95
3-Z-H-1-95	May 23, 1995 11:00 a.m. ADT	This emergency order opens the Norton Sound herring gillnet fishery in Subdistricts 1, 2, and 3 to commercial fishing, beginning 1100 a.m. and running until 1:00 p.m. Tuesday, May 23. Each boat will be limited to not more than 1000 fathoms of gill net.	For the last three days herring biomass and spawn coverage has expanded at a rapid rate. During the same time, roe quality has remained at a marketable level, the proportion of females has remained constant and near 50%, and the age composition has been predominantly large old herring. The projected age composition indicated less than 40% of the return will be susceptible to a gillnet fishery. Large old herring generally return to spawn a few days earlier than the younger herring. Given the gillnet fleet allocated the majority of the harvest an opening should be allowed as soon as possible. The biomass observed to date is relatively small at 3,600 st. Because of the necessity of harvesting the older age classes and the fairly thin coverage of herring in the district, fishermen will be allowed 100 fathoms of gillnet during this opening and a relatively long seven hour opening. This opening is timed to occur on the plateau of high tide scheduled for May 23. The intent is to minimize the harvest of spent herring which often occur on the ebb tide.
3-Z-H-2-95	May 23, 1995 6:00 a.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 1, 2, 3, beginning 6:00 p.m. and running until 10:00 a.m. Wednesday, May 24. Each boat will be limited to no more than 100 fathoms of gillnet.	Although the herring biomass present near the beach is relatively small, it is comprised of primarily old age herring with acceptable roe recoveries. Current industry reports are that fishing began slow, but catch rates are increasing as more fish are coming to the beach at both Cape Denbigh and St. Michael Subdistricts. This year's biomass is comprised of two dominate size groups and the commercial fishing fleet is geared to target the older age class. Spawn has been observed increasing over the past four consecutive days. The total harvest thus far is low. By extending this period, fishermen will be able to catch those fish which their gear is designed to target before that age group passes through the fishery or becomes mixed with immature roe and younger age classes.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-H-3-95	May 24, 1995 2:00 p.m. ADT	This emergency order opens a Norton Sound herring beach seine commercial fishing period in Subdistricts 2 and 3 beginning 2:00 p.m. Wednesday, May 24 until 5:00 p.m. Wednesday, May 24.	The herring biomass present near the beach continues to be comprised of primarily old age herring with acceptable roe recoveries. Because of the reduced processing and holding capacity compared to previous years, the majority of the buyers cannot purchase any more herring at this time. Continued gillnet fishing would leave most gillnet fishermen without a market. The slower harvest rate of a beach seine opening would allow time to process caught herring. This would also allow beach seiners an opportunity to harvest their portion of quality sac roe herring. Although most tenders are near capacity, companies have designated tenders for beach seine caught herring. With continued lower quantities of fish near the beach, it is unlikely that beach seiners will overharvest their holding capacity..
3-Z-H-4-95	May 25, 1995 3:00 a.m. ADT	This emergency order opens the Norton Sound herring gillnet fishery in Subdistricts 1, 2, and 3 to commercial fishing, beginning 3:00 a.m. Thursday, May 25 and running until 10:00 a.m. Thursday May 25. Each boat will be limited to not more than 100 fathoms of gillnet.	This emergency order opens the Norton Sound herring gillnet fishery in Subdistricts 1, 2, and 3 to commercial fishing, beginning 3:00 a.m. Thursday, May 25 and running until 10:00 a.m. Thursday May 25. Each boat will be limited to not more than 100 fathoms of gillnet.
3-Z-H-5-95	May 25, 1995 10:00 a.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistricts 1, 2, and 3 beginning 3:00 a.m. until 12:00 noon Thursday May 25. Each boat will be limited to not more than 100 fathoms of gillnet.	The latest reports from this morning's opening indicate there are pockets of high quality still available to gillnet fishing. Catches are declining in nearly all locations in the last 24 hours. This two hour extension will allow fishermen to complete the harvest of the school of fish they have locate in the last few hours, but will discourage further exploration and testing of poor quality herring which now predominate through most of the district.
3-Z-H-6-95	May 25, 1995 2:00 p.m. ADT	This emergency order opens a Norton Sound herring beach seine commercial fishing period in Subdistricts 2 and 3 beginning 2:00 p.m., May 25 until 8:00 p.m. Thursday, May 25.	Yesterday's beach seine opening harvested 128 st at 10.3% in three hours. We believe similar conditions exist for the opening scheduled in this order. Large older herring have been found in the test-net samples from the Blueberry Point area and spawning is reported to be occurring today at Besboro Island. With the declining abundance of ripe older herring this may be the only fishing opportunity for the next several days. Spent fish and unripe fish could cause unmarketable quality as the older fish cycle out of the fishery and the younger age class moves in. Given the harvest rate in the first opening, this opening should not exceed the beach seine harvest guideline.
3-Z-H-7-95	May 26, 1995 1:00 p.m. ADT	This emergency order opens a Norton Sound herring beach seine commercial fishing period in Subdistricts 2 and 3 beginning 1:00 p.m., May 26 until 7:00 p.m. Friday, May 26.	The total beach seine harvest is 240 st at 10.2% caught in 9 hours of fishing time. The bulk of the large older herring have spawned out and the younger middle age portion of the biomass is just beginning to arrive. Beach seining has been relatively slow due to few schools of quality herring near suitable fishing sites. Yesterday's seine harvest indicated that small quantities of marketable herring were found at Besboro Island. This 6 hour fishing period will provide beach seine fishermen the opportunity to locate and harvest herring remaining in the quota. Given the harvest rate in the previous periods, this opening should not exceed the beach seine harvest guideline.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-H-8-95	May 26, 1995 12:00 noon ADT	This emergency order opens Subdistrict 1 to the educational permit herring fishery, beginning 12:00 noon Friday May 26 until 10 tons have been harvested.	A ten ton harvest has been allowed annually since 1989 for the educational permit held by the Bering Strait School District. This fishery can be used to the quality and quantity of herring available to a possible gillnet fishery in that subdistrict as well as providing an opportunity for the vocational class. This small harvest will not affect the potential of any future gillnet opening.
3-Z-H-9-95	May 28, 1995 7:00 a.m. ADT	This emergency order opens the Norton Sound herring gillnet fishery in Subdistrict 5 to commercial fishing, beginning 7:00 a.m. Sunday, May 28 and running until 10:00 a.m. Thursday May 28. Each boat will be limited to not more than 100 fathoms of gillnet.	The estimate herring biomass now stands well above the harvest projection of 31,000 st. The total harvest is roughly 3,400 st, well below the 20% harvest allowance. An aerial survey flown this afternoon found an estimated biomass of 7,100 st in Subdistrict 5. The herring seemed to be preparing to spawn and samples from several different commercial test nets indicated large ripe fish predominated in the area. This biomass provides an opportunity to harvest an additional portion of the harvest guideline. A short opening will be allowed to better evaluate the roe quality in this subdistrict. If the roe quality proves marketable an extension is likely.
3-Z-H-10-95	May 28, 1995 10:00 a.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 5 beginning 7:00 a.m. until 4:00 p.m. Sunday May 28. Each boat will be limited to not more than 100 fathoms of gillnet.	The latest reports from this morning's opening indicate there is high quality product being delivered. Catches are strong and the fish are in locations that provide good fishing opportunities. This northern migration of herring typically moves fairly quickly along the coast and is expected to be west of Cape Darby within 24 hours. The window of time to fish this body of herring is limited and so a fairly long extension was granted. The guideline harvest is not within reach of this opening.
3-Z-H-11-95	May 28, 1995 12:30 p.m. ADT	This emergency order opens a Norton Sound herring beach seine commercial fishing period in Subdistrict 5 beginning 12:30 p.m., May 28 until 4:00 p.m. Sunday, May 28.	The total beach seine harvest is 307 st at 10.1%, roughly one half of the guideline harvest. There is a considerable biomass currently in Subdistrict 5. The biomass is traveling west and represents a possible means of filling the remainder of the beach seine harvest guideline. Roe quality is above the commercial minimum and is not likely to decline within the next 24 hours. A 3.5 hour opening is being allowed to take advantage of this opportunity.
3-Z-H-12-95	May 28, 1995 4:00 p.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 5 beginning 7:00 a.m. until 8:00 p.m. Sunday May 28. Each boat will be limited to not more than 100 fathoms of gillnet.	The latest reports from today's opening indicate there is high quality product being delivered in Subdistrict 5. Catches are strong and the fish are in locations that provide good fishing opportunities. This northern migration of herring is moving fairly quickly along the coast and is expected to be west of Cape Darby within 24 hours. The window of time to fish this body of herring is limited and so an additional extension was granted. The guideline harvest is not within reach of this opening.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-H-13-95	May 28, 1995 8:00 p.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 5 that began at 7:00 a.m. until 10:00 a.m. Monday May 29. Secondly, this emergency order also opens a gillnet commercial fishing period in Subdistrict 6 beginning 8:00 p.m. until 10:00 a.m. Monday May 29. In both Subdistricts 5 and 6, each boat will be limited to not more than 100 fathoms of gillnet. Finally, this emergency order opens a gillnet commercial fishing period in Subdistricts 1, 2, and 3 beginning 10:00 p.m. until 10:00 a.m. Monday May 29. In Subdistricts 1, 2, and 3, each boat will be limited to not more than 50 fathoms of gillnet.	The latest reports from today's opening indicate there is high quality product being delivered in Subdistrict 5. Catches are strong and the fish are in locations that provide good fishing opportunities. This northern migration of herring is moving fairly quickly along the coast and is expected to be west of Cape Darby within 24 hours. The window of time to fish this body of herring is limited and so an additional extension was granted. The northern migration of herring is moving fairly quickly along the coast and has begun to build west of Cape Darby in Subdistrict 6. With the high quality product being delivered in Subdistrict 5, Subdistrict 6, which is located immediately to the east, is being opened to allow a simultaneous period with the period extension in Subdistrict 5 which is intended allow for an uninterrupted harvest of herring as they pass from one subdistrict to the next. In addition, another opening in Subdistricts 1, 2, and 3 is scheduled to end at 10 a.m. also. Commercial test fishing along the coast between Shaktoolik and Unalakleet indicate the presence of herring which are of both sufficient quality and quantity to justify a commercial period even though they are not visible to aerial surveyors. Department test samples in the same area indicate that these herring have a significant younger age class component compared to the previous openings. All commercial gillnet fishermen are equipped with nets that target primarily the older age classes, while approximately half of the fishermen have gear suitable for the younger fish. Previous fisheries have shown that the smaller herring pass through the large mesh nets, often losing many scales. It is believed that scale loss makes fish susceptible to infection or fungus that could increase mortality. By limiting fishermen to not more than 50 fathoms of gear, fewer large mesh nets would be used than if 100 fathoms were allowed, which may help to minimize potential waste. The combined fishing time in all three openings is the estimated amount required to approach the preseason guideline harvest.
3-Z-H-14-95	May 29, 1995 10:00 a.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistricts 1, 2, and 3 that began at 10:00 p.m. Sunday May 28 until 2:00 p.m. Monday May 29. Each boat will be limited to not more than 50 fathoms of gillnet.	The commercial gillnet fishing period currently underway in Subdistricts 1, 2, and 3 is harvesting acceptable quality herring and indications are that similar herring remain in the area. Fishermen are moving with the good herring and the high quality is expected to continue. By extending this commercial fishing period now, fishermen will be able to stay with and harvest a known marketable portion of the stock. It is anticipated that the harvest taken during this extension will approach the preseason harvest guideline.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-H-15-95	May 31, 1995 10:30 a.m. ADT	This emergency order opens a Norton Sound herring gillnet commercial fishing period in Subdistrict 5 beginning at 10:30 a.m. until 3:00 p.m. Monday, May 31. Each boat will be limited to not more than 100 fathoms of gillnet.	Recent department and industry aerial surveys have documented a harvestable biomass of herring remaining in Subdistrict 5. Currently there are still about 1,400 tons remaining as an allowable harvest for the gillnet fishery in Norton Sound. The majority of buyers are still interested in purchasing quality sac roe herring. With the concern of the biomass being recruit herring, the department's crew was sent to the vicinity of Elim to test fish. The majority of the fish were larger, older fish. Industry testing found a range of quality with a mix of spent and ripe females. Samples improved as the tide began rising but quality remained just above 9%. The majority of the buyers were satisfied with the samples and requested an opening. The department warned buyers and fishermen that quality was marginal and to deliver frequently so that quality could be monitored. Buyers are to call the department one and one-half hours prior to the closure with preliminary results. This will allow managers to assess quality for a possible extension.
3-Z-H-16-95	May 31, 1995 3:00 p.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 5 that began at 10:30 a.m. until 7:00 p.m. Monday, May 31. Each boat will be limited to not more than 100 fathoms of gillnet.	Buyers have reported steady catches while the quality seems to be holding. With the slow harvest rate, there is little chance of going over the harvest guideline or reaching the fleets tendering capacity. Therefore, a four hour extension will be allowed. The department continues to encourage fishermen to deliver frequently so that quality can be monitored by the buyers. Buyers are to report to the department one and one-half hour prior to the closure with preliminary results. This will allow managers to assess quality and quantity before another extension is granted.
3-Z-H-17-95	May 31, 1995 7:00 p.m. ADT	This emergency order extends the Norton Sound herring gillnet commercial fishing period in Subdistrict 5 that began at 10:30 a.m. until 11:00 p.m. Monday, May 31. Each boat will be limited to not more than 100 fathoms of gillnet.	Buyers have reported steady catches while the quality seems to be holding. Although, some fishermen are finding it necessary to move to further out on Cape Darby to maintain the rate of harvest. With the slow harvest rate, there is little chance of going over the harvest guide line or over harvesting the fleets holding capacity. Therefore an extension will be allowed. Test samples from late evening the previous day and early morning hours of May 31 during an outgoing and low tide showed less than acceptable quality. The department cautioned buyers this may happen again as the tide drops. If the quality and quantity decline during the evening, another extension his highly unlikely. The department encourages fishermen to be cautious and deliver frequently so that quality can be monitored by the buyers. Buyers are to call the department one and one-half hours prior to the closure with preliminary results. This information will allow managers to assess the fishery for a possible extension.

Appendix G3. Emergency orders issued during 1995.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-H-1-95	June 16, 1995 6:00 p.m. ADT	This emergency order closes Grantley Harbor to commercial herring fishing effective Noon June 16 until July 31.	The harvest of herring in the commercial herring fishery at the Port Clarence District has been quite slow. The harvest has focused on herring believed to be a local nearshore stock. The pelagic herring that typically support a commercial fishery have not yet arrived. The fishery has taken a fairly high proportion of incidental species, i.e. whitefish, char and cod. The market is no longer interested in these species and so possibility of waste has increased. Several individuals have called to express their concern for the various species and the potential impacts on subsistence harvests. This closure is intended to direct the commercial fishery away from the communities of Teller and Brevig and toward the entrance of Port Clarence where successful fisheries on the pelagic stocks have occurred in the past.
3-Z-K-1-95	July 1, 1995 12:00 noon ADT	This emergency order relaxes the closure line described in regulation both northward to 64°20' north latitude and eastward to 161°15' west longitude to be effective at the fishery opening at noon July 1.	The preseason pot survey completed Wednesday indicates the center of abundance of the Norton Sound red king crab stock is in the deep water from Cape Nome east, roughly five to ten miles offshore. The closure line has been set along the outer edge of that concentration. The crab are expected to migrate offshore as the season progresses, thereby moving into the commercial fishery. The sublegal and legal crab are currently concentrated in the same areas. The legal size crab are expected to migrate at a slightly more rapid pace allowing the fishery to avoid the slower sublegal crab. Residents of eastern Norton Sound villages have requested that commercial fishing be allowed in areas accessible to their villages. The low level of effort present in eastern Norton Sound is not expected to have a significant impact on the winter crab fisheries.
3-Z-K-2-95	July 15, 1995 12:00 noon ADT	This emergency order relaxes the closure line described at the beginning of the season eastward to 166°30' west longitude but no closer than three miles to mean high water to be effective at noon July 15. Crab fishermen who plan to set pots in Statistical Areas 666402, 666431, 676400, 676430, and 676501 will be required to maintain a catch log that is available at the Nome office.	Interest has been expressed by processors and fishermen in the northwestern portion of the Norton Sound Section. This portion of the section has never had summer commercial fishing effort. There is a possibility of a marketable red or blue king crab density in that area. There has been no surveys of the area to assess the crab resource. The Department is requiring all fishermen of the northwestern portion to complete a catch reporting log. The Department may find it necessary to close select areas to protect the sublegal portion of the population. Fishermen are reminded the ten mile closure line around King Island is still in place.
3-Z-K-3-95	July , 1995 6:00 a.m. ADT	This emergency order extends the Norton Sound summer commercial king crab season two days, until noon Tuesday.	The current harvest is now roughly 90% of the guideline harvest. The final season harvest is expected to fall short of the preseason goal by a small amount. Poor weather has hampered the retrieval of the commercial pots during the last several days. The boats working in eastern Norton Sound have had to contend with particularly high seas. Weather forecasts now predict winds to diminish on September 4. The extension is intended to provide an opportunity for those less seaworthy vessels to retrieve their pots and sell their catch. In light of the fact that the better prepared vessels and crews have already retrieved their pots, there will be no further extension.

Appendix G4. Norton Sound, Port Clarence, Kotzebue Sound processors and associated data, 1995.

Company	Address	Type of Processing	District
Aqua Tech	P.O. Box 10119 Anchorage, Ak 99510	Fresh Crab	Norton Sound
Arctic Fish Co.	Kotzebue	Fresh Salmon	Kotzebue
Glacier Fish Co. (Co-op herring with Trident and NSEDC)	1200 West Lake Ave Suite 900 Seattle, Wa 98109	Frozen Salmon Frozen Herring	Norton Sound Norton Sound
Icicle Seafoods	4019-21st Ave West Seattle, Wa 98199	Frozen Herring	Norton Sound
Inlet Fisheries	P.O. Box 530 Kenai, Ak 99611	Fresh Salmon	Kotzebue
Kotzebue Commercial Fisherman Inc.	P.O. Box 193 Kotzebue, Ak 99752	Fresh Salmon	Kotzebue
New West	601 West Chestnut Bellingham, Wa 98226	Frozen Herring	Norton Sound
Nome Crab Co.	P.O. Box 1004 Nome, Ak 99762	Frozen Crab	Norton Sound
Norton Sound Crab Co.	P.O. Box 906 Nome, Ak. 99762	Frozen Crab Frozen Salmon Misc Bait Fish	Norton Sound Norton Sound Norton Sound
Norton Sound Economic Dev. Corp. (Co-op herring with Glacier & Trident)	P.O. Box 39089 Elim, Ak 99739	Frozen Herring	Norton Sound
Norquest	4225 23rd Ave West Seattle, Wa 98199	Frozen Herring	Norton Sound
North Alaska Fisheries	Kotzebue	Fresh Salmon	Kotzebue
Pan Pacific Seafood	150 Nickerson St. Suite 103 Seattle, Wa 98109	Frozen Herring	Norton Sound

<u>Company</u>	<u>Address</u>	<u>Type of Processing</u>	<u>District</u>
Trident (co-op herring with Clacier & NSEDC)	5303 Shilshole Ave Nw Seattle, Wa 98107	Frozen Herring	Norton Sound
Whitney Foods	4401 W Intl Airport Rd Anchorage, Ak 99502	Fresh Salmon	Norton Sound
YAK Inc	180 Nickerson St. Suite 105 Seattle, Wa 98109	Frozen Herring	Norton Sound

LITERATURE CITED

- ADF&G. (Alaska Department of Fish and Game). 1996. Norton Sound- Port Clarence-Kotzebue Sound Annual Management Report, 1994. Division of Commercial Fisheries Management and Development. AYK Regional Information Report No. 3A96-02. Anchorage.
- ADF&G. 1996. Pacific Herring Stocks and Fisheries in the Arctic-Yukon-Kuskokwim Region of the Bering Sea, Alaska, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries. AYK Regional Information Report No. 3A96-01. Anchorage.
- Barton, L.H. 1978. Finfish Resource Surveys in Norton Sound and Kotzebue Sound. Alaska Department of Fish and Game, Division of Commercial Fisheries. AYK Region OCS Report. Alaska Marine Environmental Assessment Project, Research Unit 19. September, 1978. Anchorage.
- Bockstoe, John. 1979. The Archeology of Cape Nome, Alaska. The University Museum, University of Pennsylvania, Philadelphia.
- Brennan, E.L. and T.R. LaFlamme. 1995. Norton Sound Winter Red King Crab Studies 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. AYK Regional Informational Report No. 3A95-20. Anchorage.
- Brennan, E.L. 1996. Norton Sound Summer Commercial Red King Crab Fishery Observer Project Summary Report, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. AYK Regional Informational Report No. 3A96-09. Anchorage.
- Bue, F.J. 1995. 1995 Norton Sound Salmon Season Summary. Memorandum to Rich Cannon from Bue. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Nome. November 28, 1995.
- Bue, F.J. and C.F. Lean. 1995. 1995 Norton Sound District Salmon Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. Regional Information Report No. 3A95-28. Anchorage.
- Georgette, Susan. 1996. *In press*. Norton Sound, Port Clarence, Kotzebue Subsistence Salmon Fishery, 1995. Alaska Department of Fish and Game, Division of Subsistence. Nome.
- Knuepfer, G. *In press*. Cape Denbigh Herring Test Fish Project. Memorandum to Fred Bue. 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Nome.
- Lean, C.F. 1994. Norton Sound Red King Crab Preliminary Report. Memorandum to John Hilsinger. August 23, 1994. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Nome.

LITERATURE CITED (continued)

- Lean, C.F. 1995. 1995 Norton Sound Herring Preliminary Report. Memorandum to Tom Kron. August 17, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Nome.
- Lean, C.F. and E.L. Brennan. 1995. 1995 Norton Sound District Shellfish Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries. AYK Regional Information Report No. 3A95-31. Anchorage.
- Lingnau, T.L. 1994. Kobuk River Test Fishing Project, 1994. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. Regional Information Report No. 3A94-35. Anchorage.
- Lingnau, T.L. 1994. Kotzebue Season Summary, 1994. Memorandum to Rich Cannon. October 10, 1994. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Kotzebue.
- Lingnau, T.L. and C.F. Lean. 1995. Kotzebue District Fisheries Report, 1995 to the Alaska Board of Fisheries. Department of Fish and Game, Division of Commercial Fisheries. AYK Regional Information Report No. 3A95-32. Anchorage.
- Persons, C. 1995. 1995 Kikitarik Herring Test Fish. Memorandum to Fred Bue. June 18, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Nome.
- Ray, D.J. 1984. Bering Strait Eskimo. *In* Handbook of North American Indians, Volume 5, Arctic, William C. Sturtevant, gen. ed., David Damas, vol. ed. pp. 285-302. Smithsonian Institution, Washington.
- Ray, D.J. 1975. The Eskimos of Bering Strait, 1650-1898. University of Washington Press, Seattle, WA.
- Rob, P.J. 1995. 1995 Nome River Counting Tower Report. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. Regional Information Report No. 3A95-26. Anchorage.
- Rob, P.J. 1995. Niukluk River Counting Tower Report, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. Regional Information Report No. 3A95-27. Anchorage.

LITERATURE CITED (continued)

- Rob, P.J. 1996. Kwiniuk River Counting Tower Report, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. Regional Information Report No. 3A96-08. Anchorage.
- Rob, P.J. *In Press* b. 1995 Unalakleet Test Fish Project Summary. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. AYK Regional Informational Report No. . Anchorage.
- Thomas, Dan. 1982. The Role of Local Fish and Wildlife Resources in the Community of Shaktoolik, Alaska. Alaska Department of Fish and Game, Subsistence Division. January 15, 1982.